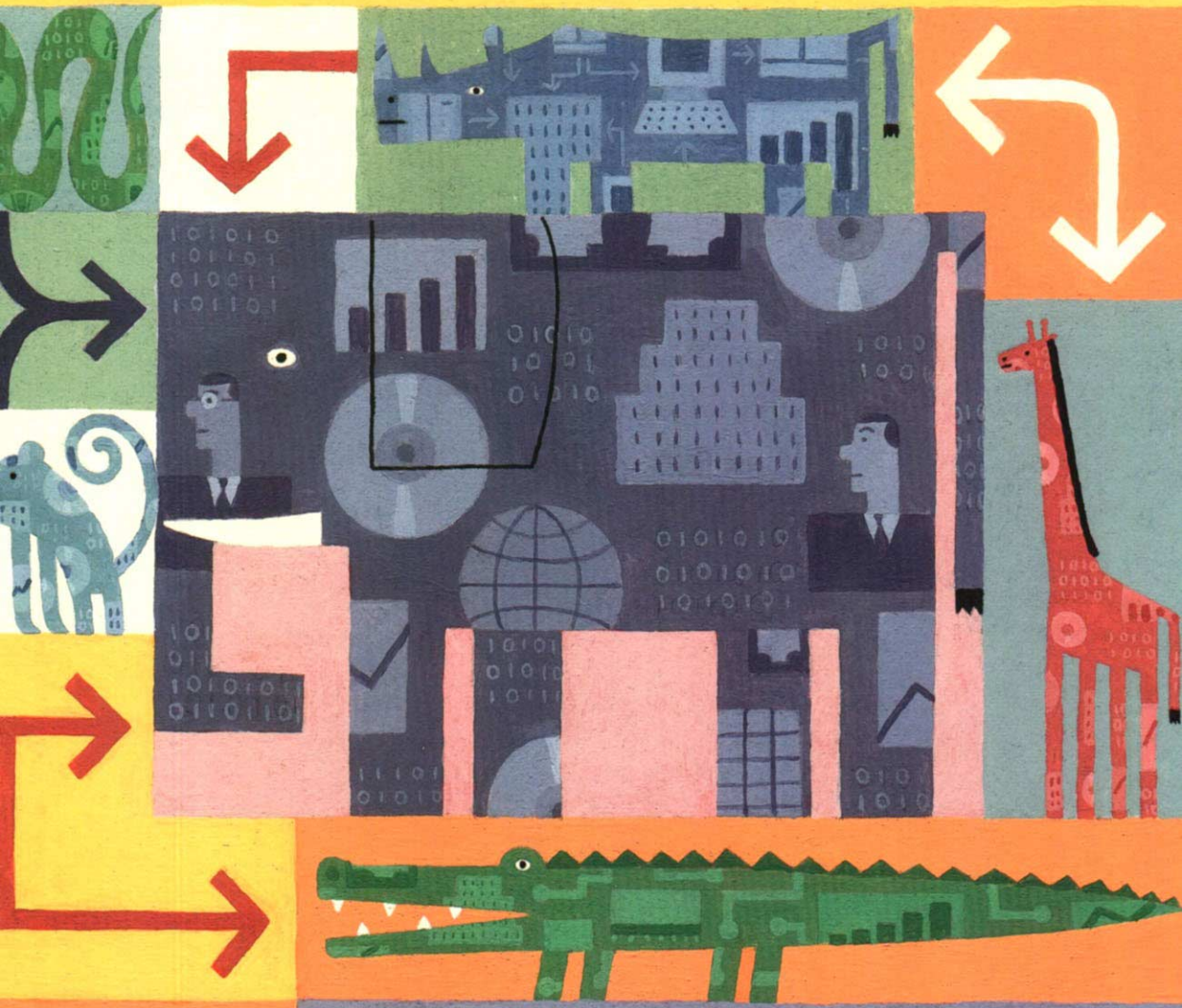
THE MILKEN INSTITUTE
Review
A JOURNAL OF ECONOMIC POLICY
FOURTH QUARTER 2002

Business Ecosystems



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Charles Darwin, Meet Peter Drucker

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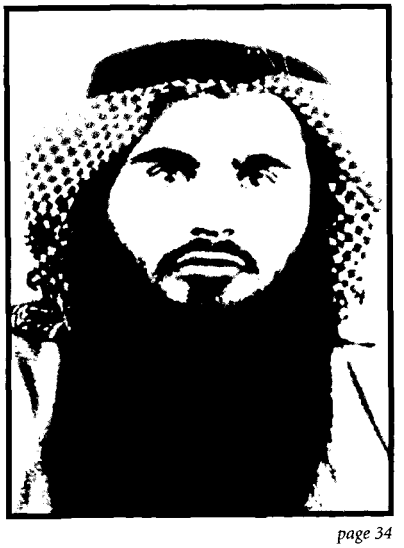

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THE MILKEN INSTITUTE MISSION STATEMENT

The Milken Institute is an independent economic think tank. Our mission is to improve the lives and economic conditions of diverse populations in the U.S. and around the world by helping business and public policy leaders identify and implement innovative ideas for creating broad-based prosperity.

We put research to work with the goal of revitalizing regions and finding new ways to generate capital for people with original ideas. We do this by focusing on:

- **Human capital** – the talent, knowledge and experience of people, and their value to organizations, economies and society.
- **Financial capital** – innovations that allocate financial resources efficiently, especially to those who ordinarily would not have access to it, but who can best use it to build companies, create jobs and solve long-standing social and economic problems.
- **Social capital** – the bonds of society, including schools, health care, cultural institutions and government services, that underlie economic advancement.

The Milken Institute Review offers some of the most provocative thinking on today's economic, social and demographic issues. And in every issue we include a sampling of our own contributions, such as Ross DeVol's essay on the Institute's State Technology and Science Index on page 86.

While the Institute's research is diverse, it contains a common thread. We're working to build prosperity by encouraging creative uses of capital and by focusing on innovative economic development ideas. Recently, I asked our staff to revise the Institute's mission statement to reflect this focus.

We use our research to generate results-oriented policy ideas and recommendations. We exchange ideas and solutions with experts around the world and help decision makers better understand how to use market-based solutions on a wide range of issues, from finance and economic development to the environment and medical research. We hold educational roundtables, forums, seminars and conferences, and publish our research findings and conference outcomes.

By creating ways to spread the benefits of human, financial and social capital to as many people as possible – the *democratization of capital* – we hope to contribute to prosperity and freedom in all corners of the globe. We are nonprofit, nonpartisan and publicly supported.

To achieve our goal we must, of course, be able to support the work financially. While Michael Milken generously endowed the Institute in 1991, the bulk of our research is funded through grants and contributions from governments, foundations and other nonprofit organizations, corporations and individuals.

That's where you come in. First, we are in the initial stages of a creating the Milken Institute Associates program to attract support from individuals, companies and foundations. Second, beginning next year, we will ask readers to pay a modest subscription fee for *The Milken Institute Review*. We're glad to have you aboard, and trust you enjoy the articles that the editor, Peter Passell, assembles. But to make ends meet, we must begin charging for the magazine.

We'll be in touch when we finalize plans for both the Milken Institute Associates and the switch to paid subscriptions. Meanwhile, please enjoy the new issue.

Michael Klowden
President and CEO

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Summer's over, and autumn, with its palette of reds and golds and yellows, has resummoned death in all its terrible beauty. Well, actually, there are no seasons to speak about here in Santa Monica – just a touch of rain and fog at random intervals to accent the sunshine. But I always wanted to write one of those hokey "seasons" editorials when I was toiling at *The New York Times*...

And now that I've briefly indulged the impulse, allow me to introduce yet another slam-bang issue of America's best loved quarterly devoted to economic policy.

Marcus Noland of the Institute for International Economics in Washington brings us up to date on the new technology of scamming – in particular, on the adaptation of the classic West African "419" scam to the age of e-mail. "It has been estimated that globally, the 419 scams pull in anywhere from $2-5 billion a year," writes Noland. "If true, this would mean that revenue from scamming would be as large a source of foreign exchange as all of Nigeria's non-oil exports, aid receipts and worker remittances combined."

Marco Iansiti of the Harvard Business School and **Roy Levien** of National Economic Research Associates offer a striking alternative to the traditional analysis of markets used by trustbusters – an alternative that accounts for the ecosystem-like complexity of interactions in so-called "network" industries.

"Business ecosystems don't even remotely fit the boundaries of product or service markets," they point out, "and thus the influence of firms with aggressive business strategies should not be judged solely by their competitive impact on conventionally defined industries. Wal-Mart, with its remarkable integrated vendor-supply system, may eat rival retailers for breakfast, lunch and dinner. But the potential damage to competition in retailing associated with greater industrial concentration should be weighed against the potential productivity gains for the consumers and suppliers that share in the benefits of Wal-Mart's innovations."

The origins of international terror lie in the frustrations of underdevelopment. Or maybe not. **Jennifer Bremer** and **Jack Kasarda** of the Kenan Institute see it as a symptom of

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economic development stalled midstream. "If we are to win the war on terrorism," they write, "we must recognize that it is not the poverty of the third world, but our shared failure to manage third world countries' transition out of poverty that is endangering our nation as well as theirs."

They offer a taxonomy of what they call the New Second World that divides transition states into three stages of development. "Together, the three groups forming the New Second World possess the economic scale and political scope to redefine global affairs. At the same time, the development processes going on within them generate stresses capable of endangering both rich and poor nations."

Sheldon Danziger of the University of Michigan takes a cool look at welfare reform six years after its passage – and in the middle of the debate over its reauthorization by Congress. Both House and Senate bills, he notes, call for states to increase the percentage of welfare recipients who are at work beyond what was achieved during the economic boom. Washington, he says, "seems to be assuming that welfare recipients will always have the chance to look for jobs in a labor market with a 4 percent unemployment rate."

With the stock market in the doldrums and investors nursing their wounds, what better time for a lesson in matching corporate capital structure to business risk? **Michael Milken**, who among many other things is chairman of the Milken Institute, offers a sophisticated primer.

"Traditional 'hard' assets – land, buildings, machinery – can lose value even as less tangible factors – human capital, management information systems, digital distribution networks – strengthen a company's ability to succeed," he reminds. And "that kind of disparity between book value and real prospects sometimes contributes to popular myths. Any number of newspapers will tell you that the decade of the 1980s was dominated by debt. In fact, the 1970s was the decade of debt because the value of equities declined, and the 1980s was the decade of equity. Industrial companies ended the 1980s less leveraged than they entered it."

University of London Professor **Alison Wolf's** new book, *Does Education Matter?* is a must-read for those interested in the links between economic growth and investments in human capital. Trouble is, the book's not been published in the United States.

That's where we come in. Check out the excerpt beginning on page 49. When you're done cheering (or gnashing your teeth) over her iconoclastic views, check out the commentary by **David Card**, an economist at the University of California (Berkeley).

Hey, there is even more. The Milken Institute's **Ross DeVol** outlines the significance of the Institute's state-by-state rankings on its new Science and Technology Index. And yours truly assembles some interesting lists about everybody's favorite subject: wealth and poverty.

Happy reading. — *Peter Passell*

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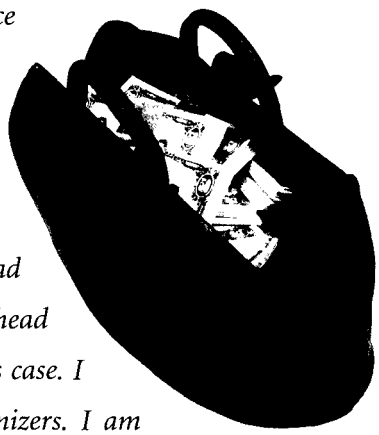
BY MARCUS NOLAND

Hi, Marcus, this is *Tracy Newton. I am 22 years old now and have been in Africa with my dad, Bill Newton, since 1996 ... About three months ago, my father came to Nigeria at the request of the new government. During a meeting with some officials, state security officers arrested him for questioning ... Before he was detained, my dad transferred a large amount of money out of Sierra Leone to Europe ... Since my dad is uncertain about when he will be released, he wants me to go ahead and retrieve the deposit ... so we can retain lawyers to fight his case. I found your contact information inside one of my dad's organizers. I am reaching you now because I need you to help me secure the funds. We will monetarily compensate you. Please reply back as soon as possible. Thanks much,* Tracy Newton



Bill, I hardly knew ye.

Sound familiar? In the past year, millions of people with e-mail accounts probably have received a similar – though probably not as well-written – message from Nigeria's notorious 419 scammers. Named for the section of the Nigerian penal code covering fraud, this venerable racket has used the Internet to join the New Economy. In the past, 419 scammers actually had to post forged documents to prospective marks. But with the advent of e-mail, the scammers are spamming, trawling for suckers.

While the Internet has vastly extended the reach of the con men, their nets can get tangled, creating enormous fratricidal possibilities. Recently, I received an e-mail from "Gen. Benjamin Ojiani (Ret.)," who identified himself as "the first inaugural Nigerian commander" of the ECOMOG peacekeeping operation in Liberia in which Samuel Dow was overthrown as Liberian president. The general related how "during the final onslaught which resulted in the capture of Samuel Doe, the campaign was meticulously planned and executed flawlessly; Samuel Doe's headquarters was seized by my men, and much ammunition was recovered."

Never mind that Doe was captured by a rival warlord and had his ears lopped off while being tortured to death and that the

DAVID HALE is the global chief economist at Zurich Financial Services in Chicago.

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video circulated around West Africa as a political snuff film – you know what they say about the fog of war. Anyhow, as General Ojiani tells the story, among the ammo were 10 large trunks, "When I examined the trunk boxes, I got a shock! They were stacked full of $100 bills! To my inexperienced eye, I estimated that the boxes must contain over $100 million!"

General Ojiani then did what any corrupt Nigerian general would do – he requisitioned a Hercules transport and hauled the booty back to Abuja to await the right time to get it out of the country. That moment came with the installation of Nigeria's current civilian regime. But given his high profile and a law against retired officers maintaining foreign bank accounts, General Ojiani needs a foreign partner – which is where I would come in. For my assistance, the general would give me a cut, which, according to my calculations, would come to roughly $30 million.

Just as I was about to sign on to the Ojiani gravy train and begin shopping for property in the Caribbean, I received a message from a subordinate military officer, Brig. Gen. Bibiola Waritimi. General Waritimi described the exact same campaign, which was in his modest view "meticulously planned and executed flawlessly." But in this version he discovered five boxes with $50 million.

Now I was really confused. But I was raised to "dance with the one that brung you," so I wrote to General Ojiani, "I'm not sure how to raise this issue discreetly, General, but this morning I received a message from one 'Brig. Gen. Waritimi' claiming to be your subordinate and offering me a $15 million deal on five boxes. Are you working together? I would hate to think that your associate was trying to cut a side deal without your knowledge."

General Ojiani never replied. I shudder to think what happened to the brigadier general.

Come to think of it, I never heard back from Laurent Mpeti Kabila Jr. either, after I asked him if his brother Joseph had approved his plan to move $165 million "and some thousands of carats of diamonds" out of the Congo. When asked about one Moshood Seko who kept pestering me, Joy Seko, widow of the Congo's longtime dictator Mobutu Sese Seko, (who graciously corresponds in English rather than French) advised me to stop wasting my time with this impostor – "he must be one of those people that are looking for ways to take undue advantage of one's predicament."

The travails of the Mobutu, Kabila and Savimbi dynasties have yielded a stream of narratives more byzantine than those served up by *The Sopranos*. In the last month alone, I have been contacted by widow the late Angolan rebel Jonas Savimbi (looking for help in getting $15.6 million out of the Netherlands), his daughter (trying to move $25.6 million from the Netherlands), his personal assistant (needs help getting $27 million out of Ghana) and his "top adviser" who needs a partner to gain access to approximately $45 million in gold bullion stored in London.

But for sheer volume, nothing can touch the clan of former Nigerian strongman Gen. Sani Abacha, whose widow, Hajia Mariam, has more e-mail addresses than Imelda Marcos has shoes. Of course, fratricide is only one hazard of casting one's net widely – one doesn't always know what might get ensnared, as I pointed out to Mr. Paul Abbas, a "top official of the Federal Government Contract Review Panel" of Nigeria, "You are a very lucky man. You recently sent a business proposal to a friend of mine – a high-ranking U.S. diplomat. Fortunately for all concerned, instead of reporting you to the authorities during President Obasanjo's recent visit to

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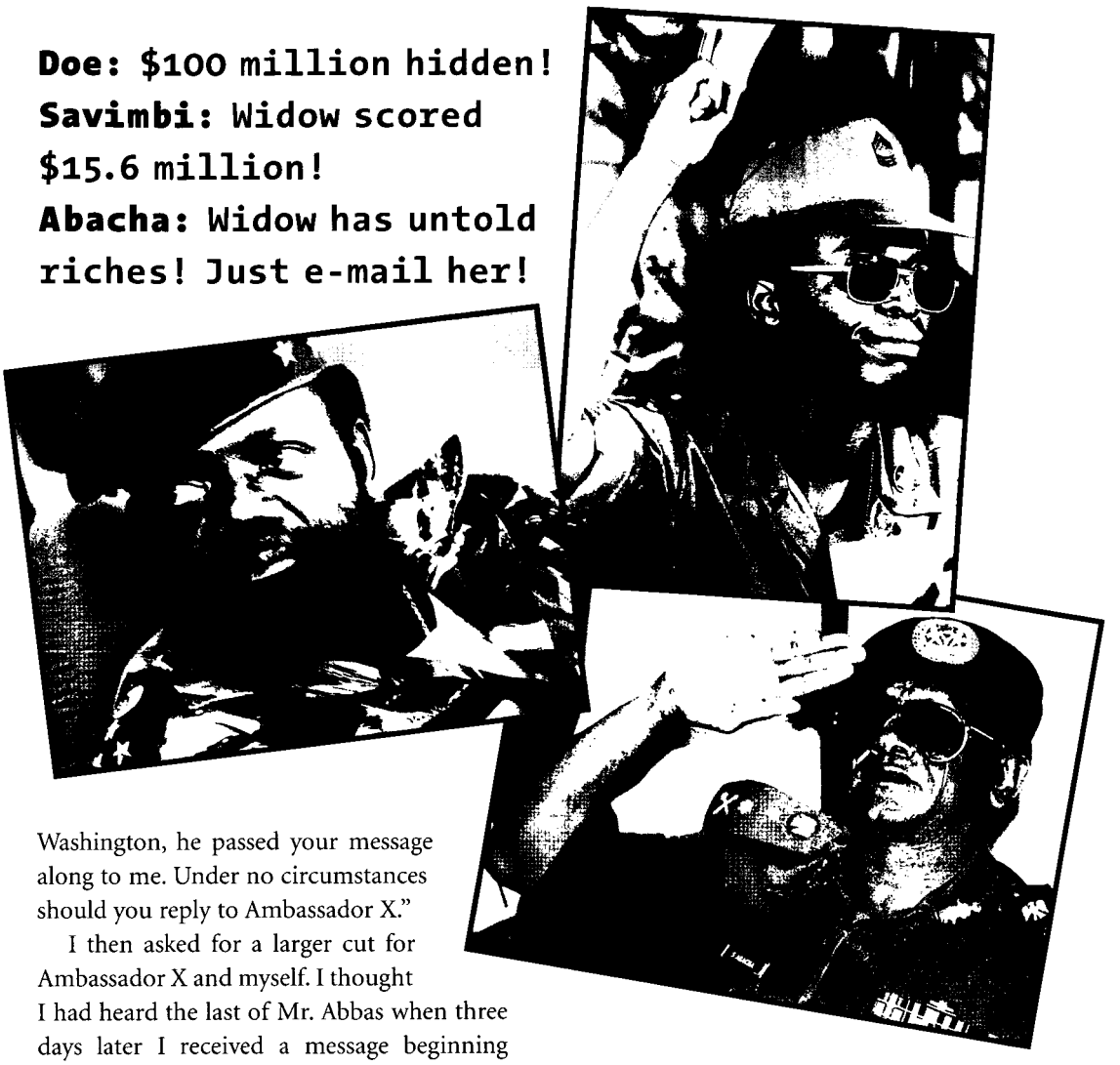
Doe: $100 million hidden!
Savimbi: Widow scored $15.6 million!
Abacha: Widow has untold riches! Just e-mail her!



CLOCKWISE FROM TOP: ©BETTMANN/CORBIS, ©AFP/CORBIS, RUBYTHON/SIPA

Washington, he passed your message along to me. Under no circumstances should you reply to Ambassador X."

I then asked for a larger cut for Ambassador X and myself. I thought I had heard the last of Mr. Abbas when three days later I received a message beginning "First, I must thank you very much for not taking my proposal to my government, in fact when I first saw your letter I was very scared, but after much deliberation with my colleagues we decided to give it a try. I hope that this is not a mistake." Mr. Abbas then made a counteroffer on the division of the spoils and attached a specimen letter to be used in defrauding the Nigerian government of $31 million.

DANGEROUS LIAISONS

It seems that the life expectancy of a foreign businessman in Nigeria is less than that of a first lieutenant on the Western Front in 1916. And though the "dead foreigner" ruse is a hardy perennial, one might think that having no idea who your message's recipient could be might give its practitioners pause. But this does not appear to be the case.

Whatever you do, stay away from William Eke, manager of the Lagos branch of the Orient Bank of Nigeria, the Dr. Kevorkian of Nigerian bankers. On a single day in 1997, two American oil industry consultants, John Leon and Barry Kelly, and a Japanese engineer named Yukio Matsuda deposited upward of

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$175 million in various accounts at Mr. Eke's bank and then were promptly killed in automobile accidents – though whether separately or together, I have never ascertained. Since no next of kin has come forward to claim these funds, Mr. Eke, whose Yoruba name could be translated into English as Mr. "Fake," "Counterfeit" or "Liar," along with his two hardworking assistants, Kuti and Adeniyi (the names of the two most popular Nigerian musicians of the past generation), have been looking for a foreign partner to help them abscond with the loot before it reverts to the government.

Of course, it helps if your foreign partner is, well, a foreigner:

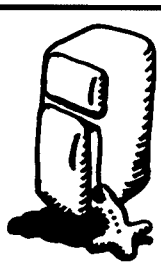
"Dear Mr. Eke, You are a very lucky man. Recently you sent a message soliciting assistance in a business transaction to an acquaintance of mine, Miss X, requesting that Miss X pose as an American oilman, Mr. Leon. Well, Mr. Eke, you can already see the problem, especially since Miss X is a Nigerian female!!! Fortunately for all concerned, she passed your request along to me, a Texan male with a long history in the oil industry and a much more suitable substitute for the departed Mr. Leon. Given your clumsy first pass – asking a Nigerian woman to pose as an American oilman – I was suspicious, but I have checked out your bank and I am willing to help. In the message that Miss X passed along, you proposed a sharing formula of 70/30. However, under the circumstances, we believe that a 40/30/30 split is more equitable. Now I know that if I were in your shoes I would be disappointed. But think of it this way: after we successfully complete this transaction, you will have two reliable business partners in the USA. Miss X can use her proceeds to hire a fine immigration lawyer and regularize her status here. Perhaps she will even be able to sponsor you!"

The logical circumlocutions in Mr. Eke's reply would confound the *Milken Institute Review*'s most savvy readers. He did insist on a 65/25/10 split, though.

While foreigners typically succumb to auto accidents, plane crashes and tropical disease,

MURDERED IN COLD BLOOD... POLITICALLY MOTIVATED

DEAD RELATIVES ARE A STAPLE OF THE 419 GENRE. AMONG THE SADLY DEPARTED:



DEAD RELATIVE
Bola Ige, minister of justice, Nigeria

CAUSE OF DEATH
"murdered in cooled blood...Politically moltivated [sic]"

ESTATE: $36.5M

DUPE'S TAKE: "well compensated"

DEAD RELATIVE
Dr. Maxwell Swarin, general overseer of the diamond mine in Kanema, Sierra Leone

CAUSE OF DEATH
"military forces...assassinated [him] mistaking him for his brother Mike"

ESTATE: $22M

DUPE'S TAKE: $3.3M plus 20 percent investment stake

DEAD RELATIVE
Amara Yapobi, wealthy cocoa merchant, Abidjan, Ivory Coast

CAUSE OF DEATH
"poisoned to death by his business associates"

ESTATE: $14.5M

DUPE'S TAKE: $2.2M

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the locals tend to die in more lurid ways. Poor Mark Williams, the only son of Chief Fred Williams of the Mende District in Sierra Leone lost his father in a rebel attack, his uncle in a plane crash and his mother to "heart failure and related complications" – surely brought on by the attacking rebels, crashing planes and a steady diet of artery clogging palm nut soup. Now he's stuck in Abidjan with $21.8 million, needs my help to get him and his sister into college, and is offering a 15 percent cut.

ANATOMY OF A FRAUD

Who, you might be asking, could fall for all this cheap melodrama? Well, quite a few of our fellow citizens, it seems. The United States Secret Service, Financial Crimes Division, which is assigned to deal with these scams, fields 400 to 600 complaints a day. An FBI survey last year found that the average loss was $5,575 per victim, and U.S. officials have put annual losses to American citizens in the hundreds of millions of dollars. It has been estimated that, globally, the 419 scams pull in anywhere from $2 billion to $5 billion a year. If true, revenue from scamming would be as large as the entire Nigerian manufacturing sector, and would be as large a source of foreign exchange as all of Nigeria's non-oil exports, aid receipts and worker remittances combined.

REVENUES FROM SCAMMING, 2000
BILLIONS OF DOLLARS

ACTIVITY	$ BILLIONS
Agriculture	12.1
Mining	18.9
Manufacturing	1.7
Services	10.1
Scamming	2-5

FOREIGN EXCHANGE EARNINGS	$ BILLIONS
Oil	18.9
Non-oil exports	0.2
Aid	0.2
Worker remittances	1.3
Scamming	2-5

SOURCE: World Bank, IMF, The 419 Coalition.

The scams work in a number of ways, but typically a fraudster contacts a potential victim describing a large sum of money, frequently obtained through questionable means and hence requiring secrecy, for which a partner – often a foreigner – is needed to gain access. For his cooperation the dupe is

MAX HARLESS

DEAD RELATIVE
Lt. Col. M. Obed, former military administrator of Kaduna state, Nigeria

CAUSE OF DEATH
"one of the victims of the 7th November 1996 ADC Aircraft Boing [sic] 727 that crashed in Lagos"

ESTATE: $30M

DUPE'S TAKE: $6M

DEAD RELATIVE
Gen. Alexandre Biros, former director of military intelligence, Sierra Leone

CAUSE OF DEATH
"murdered along with half brother in cool blood during a mid-night rebel shoot-out"

ESTATE: $18M

DUPE'S TAKE: $4.5M

DEAD RELATIVE
General Biros's wife

CAUSE OF DEATH
"very sever [sic] bullet injuries resulted to her untimely painful death"

DEAD RELATIVE
Gen. Gumel Bello, former minister of mines and power, Nigeria

CAUSE OF DEATH
"cancer of the knee"

ESTATE
$18M

DUPE'S TAKE
"negotiable"

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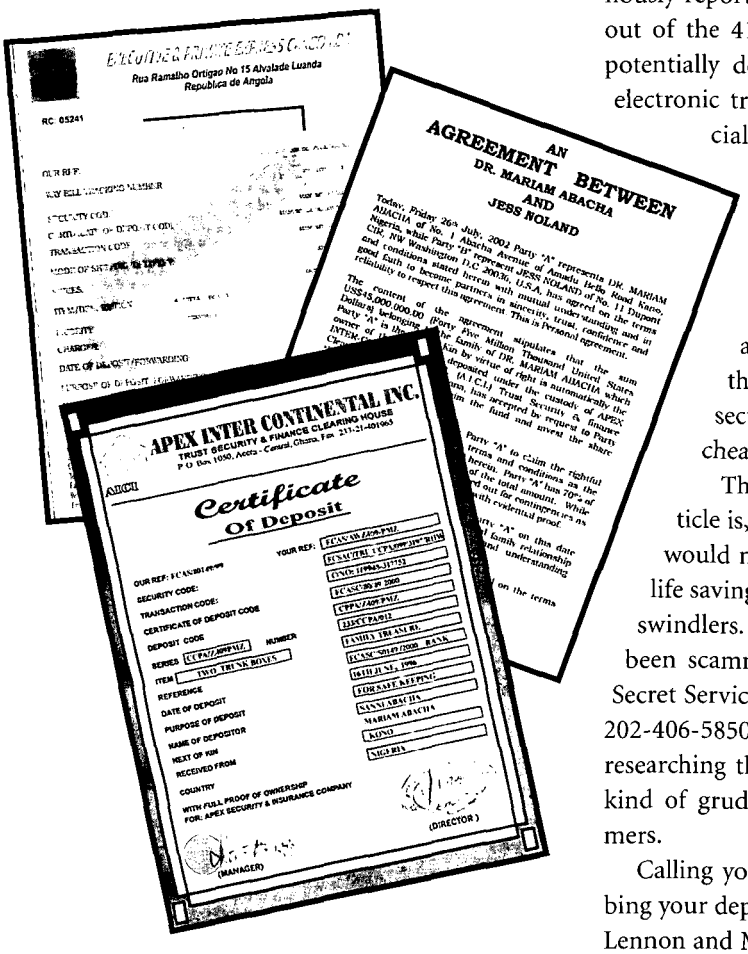
offered a cut of the proceeds. Once the victim agrees to participate, he is asked for various upfront fees to cover legal costs, travel expenses and so on, while the scammers ply the mark with photographs, forged documents and other materials intended to engender trust. The scamsters also try to get personal information like bank account and passport details that can be used to perpetrate further fraud. Eventually, the victim is asked to visit Nigeria or some other foreign location. According to the U.S. State Department, at least 15 foreigners, including one American, have been murdered in Nigeria in connection with 419 frauds in the past three years.



Officialdom has had little success in prosecuting these racketeers. The U.S. government guesses that only 5 to 10 percent of victims file reports, and the very nature of the Internet facilitates anonymity. Admittedly, compared with Enron, these swindles are still bush league. But U.S. intelligence officials ominously report that the scammers are moving out of the 419 racket into more direct and potentially destructive ways of intercepting electronic transactions and pillaging financial accounts directly. Ironically, the decrepit state of the Nigerian telecommunications system actually imposes a constraint on these operators. Modernization could unleash an explosion of 419 activity since the con artists would be able to secure reliable phone lines more cheaply.

The behavior described in this article is, of course, illegal and I certainly would not want my mother to lose her life savings – much less her life – to these swindlers. If you think that you may have been scammed, contact the United States Secret Service, Financial Crimes Division, at 202-406-5850. But by the time I had finished researching this piece, I had begun to feel a kind of grudging admiration for the scammers.

Calling yourself "Mr. Deceiver" and dubbing your deputies the Nigerian equivalent of Lennon and McCartney while spinning a tale of corruption involving the Nigerian national soccer team shows a bit more flair than simply misstating earnings and calling in Arthur Andersen to shred documents. Maybe Hollywood should give these guys a shot – their scripts would beat anything on cable TV. Globalization, indeed. M

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Business Ecosystems

Rethinking Policies toward Network Industries

by Marco Iansiti and Roy Levien

How should one evaluate – and perhaps regulate – the impact of leading firms like Microsoft, IBM or Wal-Mart on the economy? Firms that cast long shadows over their industries have always made Americans uneasy, and sometimes for good reason.

Government has responded by introducing a host of regulatory policies, in areas as different as electricity pricing and mergers and acquisitions. A relatively new rationale for intervention is the rise of industries characterized by network economies, as in: the more consumers or organizations use a technology, the more valuable it is to each user. Once a technology establishes a large enough market presence, the argument goes, superior solutions may be unable to break through, as was said to be the case with the VHS video format and the traditional QWERTY typewriter keyboard. Network

JAMES KACZMAN (ALL)

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economies are becoming increasingly common across a variety of industries ranging from software to retailing, as information technology is enabling an unprecedented degree of interaction among participants.

But the behavior of networks is often more complex than it may first appear. And this underlying complexity is frequently ignored when crafting policy, as traditional economic arguments are sometimes patched up to support simplistic points of view.

The argument for path dependence is often used to imply the evolution of virtually indestructible entry barriers caused by the high costs of shifting to alternate technologies. To the Clinton Administration, this potential buttressed the case for aggressive antitrust policy with respect to large New Economy firms like Microsoft. Thus while the antitrust case against Microsoft was by legal necessity couched in the conventional terms of restrictive practices in furtherance of a monopoly, the underlying fear was that network economies favoring Windows would prevent competing technologies from proving their worth.

The dynamics of network industries are too rich to capture with simple analogies. What is needed is a framework for assaying the logic and consequences of public intervention that offers regulators a more accurate guide. This framework is drawn from the observation that network industries, with their complex interdependencies and feedback loops, resemble biological systems. Applying this analogy to network industries yields some striking observations.

Does the potential for path dependence buttress the case for aggressive antitrust policy with respect to large New Economy firms?

First, business "ecosystems" don't even remotely fit the boundaries of product or service markets, and thus the influence of firms with aggressive business strategies should not be judged solely by their competitive impact on conventionally defined industries. Wal-Mart, with its remarkable integrated vendor-supply system, may eat rival retailers for breakfast, lunch and dinner. But the potential damage to competition associated with greater concentration should be weighed against the potential productivity gains for the consumers and suppliers that share in the benefits of Wal-Mart's innovations.

Second, the existence of organizations that are central to an ecosystem is not necessarily bad for competition, or for the health of the ecosystem as a whole. In fact, the existence of key hubs is almost inevitable in a network. Like their biological counterparts, aggressive actors in business ecosystems can play the role of "dominators" that reduce productivity and make whole systems more vulnerable to trauma, or the role of "keystones" that nourish diversity and stabilize their systems, even

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as they vigorously pursue their own ends. The presence of the former should be a red flag for regulators; the latter should not. Public policy should thus reinforce keystone-like behavior and avoid harming critical network hubs, since the associated damage may paralyze other ecosystem participants.

Third, the many interactions between participants in a network industry not only increase the cost of switching from a given technology but also increase the ease with which new solutions can be generated. This means that industrial networks that lack in innovation, efficiency and diversity will naturally be superseded by healthier networks, just as personal computers took over many of the applications originally performed by mainframes and minicomputers.

NETWORKS

Many complex entities in both the natural and the man-made world can be fruitfully viewed as networks of simpler artifacts. From the understanding of the way forest fires spread to the accurate portrayal of the effects of crowd panic, network analysis is yielding insights that conventional methods failed to produce. Similarly, there is a growing awareness that by connecting even simple components in the right way, new capabilities may be acquired. In fields as wide ranging as military communications and urban traffic management, networked designs are proving effective solutions to challenging problems.

But what is the right way to connect components? Are some network structures more effective than others?

Hubs and Robustness

Many networks exhibit a common property: a small number of nodes are much more richly connected than the vast majority of members of the system. These hubs seem to form regardless of the nature of the system. In networks with hubs, the degrees of separation between nodes – the average number of nodes that need to be visited to get from any one node to any other – is small. Perhaps the most dramatic illustration is the pattern of links among sites on the World Wide Web. Here, a system with a hundreds of millions of diverse participants evolved rapidly into a structure in which the vast majority of sites can be reached with a handful of jumps.

Hubs exhibit an important aspect of network health: they are robust in the face of random disruptions. Removal of arbitrary nodes from networks with hubs leaves most of the network intact. Conversely, networks lacking hubs are more vulnerable to random disruptions. Hubs are thus a common feature in a variety of networks, ranging from honeybee colonies to business organizations.

The role of keystones

Hubs are especially important in systems where they serve as active regulators. Such keystone hubs are a common feature of biological networks. A species serving as a hub in the web of interactions that define a biological ecosystem, for example, can improve its own chances of survival in the face of change by providing benefits to the ecosystem as a whole. Conversely, removal of keystone species can have dramatic cascading effects through the ecosystem, reducing diversity and efficiency in using resources.

It is important to appreciate that such species need not dominate their ecosystems to have great impact. In fact, keystones often constitute a small part of their ecosystems as measured by geography or biomass. Dominating species, in contrast, undermine the diversity and stability of their ecosystems precisely because they take over so much of their

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ecosystems and must thus either assume or eliminate the functions of the species they displace. An ecosystem in the grip of an invasive species is a good example of the effects of such a dominator: not only is much of the biomass of such ecosystems made up of the invader, the system simply does less. This is the fate of many North American wetlands, which have become increasingly uniform swaths of a single weed, purple loosestrife.

This is not to say all keystones are inconspicuous. Some species, like kelp in the nearshore ecosystems in the Pacific Northwest, are keystones in spite of their conspicuous presence. But kelp leaves many thriving niches unoccupied, and its removal does damage to the entire system. A distinction worth highlighting is that keystones do not occupy a large number of the nodes in the ecosystem network, while dominators do.

Dominated ecosystems are vulnerable to disruptions. This most commonly occurs when they are subjected to external stress, and is largely the result of the fact that dominated ecosystems lack the diversity to accommodate external shocks.

Keystones, by contrast, maintain the health of their ecosystems through behavior that affects the entire system, like preferentially preying on marauders or providing key nutrients to the environment. Their fate is aligned with the fate of the ecosystem as a whole. If their actions do not benefit other members of the system, they will find themselves alone, effectively transformed into the dominator of a weakened ecosystem.

THE BUSINESS ECOSYSTEM ANALOGY

Business ecosystems are large, loosely connected networks of firms, products and technologies. Like species in biological ecosystems, firms interact in complex ways, and the health and performance of each firm is dependent on the health and performance of the whole. Moreover, like species, firms and their products are therefore simultaneously influenced by internal capabilities and by the complex interactions with the rest of the system.

The boundary of a business ecosystem, like the boundaries of many biological systems, can be tricky to define. Specifically, it need not correspond to a traditional industry boundary. The computing ecosystem includes not only software and significant segments of the hardware industries, but extends into other industries that rely on computing and information technology and devote resources to adapting them to their needs.

Another important similarity between biological and business ecosystems is that firms can play different roles in pursuing operations strategies. Three are of particular importance: *keystone*, *dominator* and *niche*.

Firms pursuing keystone strategies are especially important in business domains subject to frequent external disruptions. The diversity they support serves as a buffer, preserving the overall structure and productivity of the system in the face of disruptions that may eliminate other non-keystone species. Keystones thus have the potential to preside over significant turnover in ecosystems. The successive waves of transformation that have spread through the software industry (starting with the rise of the PC and followed notably by the point-and-click user interface and the Internet) resulted in significant changes in the software ecosystem. But its overall structure, productivity and diversity are intact. And its keystones, among them Microsoft, IBM and Sun, have persisted.

Similarly, keystone species often hold in check species that would otherwise dominate

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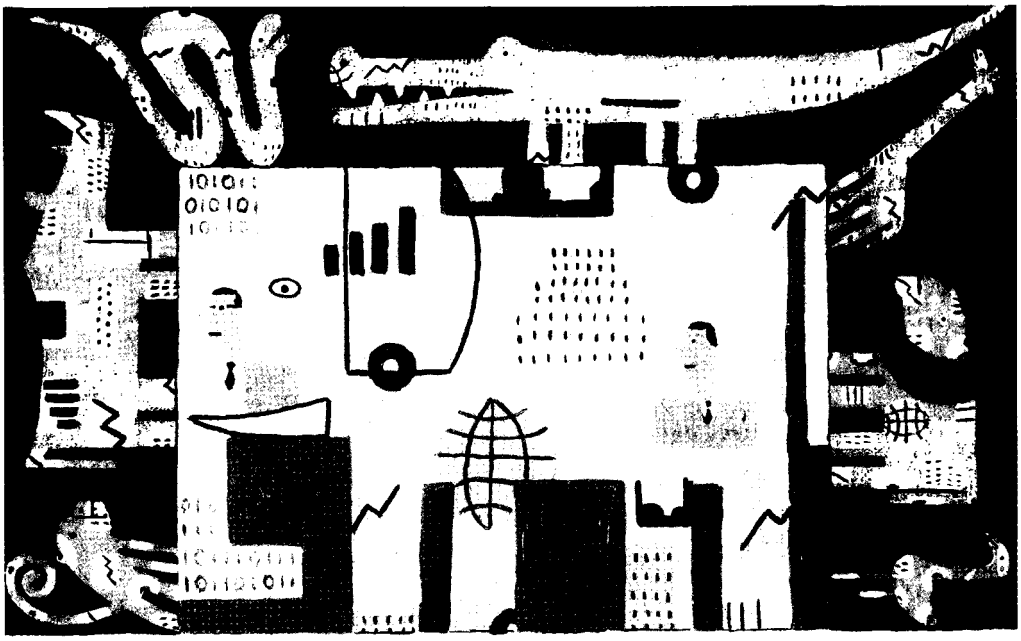

K E Y S T O N E

the system, while identifying their own interests with innovation outside the firm.

This is what the IBM-Microsoft-Intel ecosystem achieved with respect to Apple. For many years, Apple refused to license its operating system, and produced integrated hardware-software products that performed the functions of other species – acting, in effect, as a dominator. But it faded in the face of Microsoft, IBM and Intel, which acted collectively as an effective keystone: Microsoft focused its business model on software platforms, licensing its platform and software-applications design tools broadly. The sheer diversity of approaches, productivity, and the pace of innovation that Microsoft's keystone approach unleashed could not be matched by Apple's go-it-alone dominator approach.

Note that, despite their benefits to the ecosystem as a whole, all members of an ecosystem will not view keystones as beneficial. This is particularly true in cases where keystones serve as predators, destroying species that would otherwise reduce the overall productivity of the ecosystem.

Most species in an ecosystem are neither dominators nor keystones; they occupy narrow, specialized niches. These niche species individually lack the far-reaching impact of keystones or dominators, but collectively constitute the bulk of the ecosystem in terms of mass and of variety. In a sense, keystones *shape* what an ecosystem does, while niche species *are* what it does. In business ecosystems, most firms follow niche strategies. Examples include Nvidia and Broadcom in the chip industry, and Siebel Systems and Autodesk in software applications.

Business Ecosystem Fallacies

This framework dispels three widespread misconceptions about the role of high-profile

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firms. The first is the all-peers fallacy. Some argue that an industry with many small peers that compete fiercely in all domains would be more productive, stable or innovative than industries including large keystones. However, there is very little evidence for this kind of system in nature. Indeed, almost all stable and productive evolved networks are governed by some centralized control. This fallacy is more often perpetrated by the press than by economists, who are aware of the limited capacity for innovation in low-barrier industries with vast numbers of equivalent players – like lobster fishing or nail salons.

A second fallacy is the dominator fallacy. The fact that keystones persist in the face of significant turnover and that they influence the behavior of a majority leads to the mistaken view that they dominate the industry. However, like biological keystones, firms following keystone strategies are often small players by obvious measures, and have no presence at all in most niches in their ecosystem. Their influence is exerted not by size, but by the relationships that make them essential for the overall health of the system.

The litmus test in differentiating dominator from keystone should be in a ratio of biomass (or its functional equivalent in business) to impact. Strikingly, Microsoft's market cap represented just 10 to 20 percent of the capitalization of the software industry in 2001. In contrast, IBM during the 1960s made up more than 80 percent of the market capitalization of the entire computer industry, including both software and hardware vendors.

The third is the inhibitor fallacy. Because keystones sit astride critical pathways, it is often suggested that they inhibit both innovation and the free flow of information. But to survive and prosper, a keystone must ensure the resilience of the ecosystem. Instead of viewing innovation as a threat, keystones seek to increase innovation throughout the industry. By the same token, obstruction of important flows of information, value and intellectual property through critical pathways in the ecosystem would conflict with the keystone's own interests.

In networked industrial environments, innovations rarely can be identified with a single invention, but instead represent the integration of a multitude of inventions with existing products and processes.

Integration and business ecosystem evolution

One of the main reasons that business keystones can view disruptive innovations as a benefit to be encouraged is that they are in a position to magnify the effects of those innovations, to their own and the entire ecosystem's benefit, by integrating them into the core platforms on which the ecosystem relies. This feature of business ecosystems parallels the process of integration that drives the increasing complexity of evolved biological systems toward entropy.

From the evolution of social insect superorganisms from solitary ancestors to the cre-

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ation of the cellular machinery of animals and plants from once-independent bacterial precursors, ever tighter integration creates a stable core around which new capabilities can be built. Indeed, many of the novel capabilities popularly attributed to decentralized networks are dependent upon the existence of a tightly integrated core around which the looser network operates. The stunning information gathering and processing capabilities of honeybee colonies, for example, are predicated on the fact that all information is exchanged in tightly confined spaces using a language that is simple and entirely hardwired. Moreover, the mere fact of cooperation at the level required for such free exchange of information is only possible because of the near genetic identity of the apparently independent agents.

The entire notion of independence in the traditional sense is absent from almost all natural systems that exhibit "swarm intelligence." The notion of self exists only at the level of the invisible forces governing the tight integration of the colony that are a prerequisite for the more conspicuous distributed networks of interactions we actually see.

Imagine what the world would be like today if the process of biological integration had been obstructed in the ancient past. Instead of towering trees that store sunlight in chemical bonds, insects that farm fungus or build arches, or brains that execute landings on the moon, life would still be a bland soup of self-replicating chemical fragments. As a whole, then, the evolution literature suggests both that the capacity for creating novel functions is an important measure of system health and that integration is an important way of achieving such novelty.

The analogy to technology integration is illuminating: in networked industrial environments, innovations rarely can be identified with a single invention, but instead represent the integration of a multitude of inventions with existing products. The commercialization of point-and-click graphical user interface computing was not the result of a single technological development within a single organization, but of integrated advances from a variety of sources, ranging from semiconductor component technology to the invention of the mouse.

Technology integration is critical to both keystones, which must constantly integrate the latest technological developments into the platforms they provide, and the niche players, which integrate components provided by the keystones and other sources. For example, Microsoft acted as a keystone in choosing to componentize its Internet Explorer 3 browser software in 1996. This critical design decision gave independent software developers, including Intuit and Autodesk, the ability to Web-enable their individual applications, transforming the diffusion of the World Wide Web from a threat to a business opportunity.

MEASURES OF ECOSYSTEM HEALTH

The concept of ecosystem health should be central to policy debates. Critically, our framework defines tangible, measurable quantities that make it possible to structure these debates around real, data-driven analysis. We propose three dimensions of ecosystem health inspired by our biological metaphor: productivity, robustness and niche creation.

Productivity

A healthy ecosystem is a productive ecosystem. Productivity is not only central in economic analysis. It is also used extensively in literature on biological ecosystems, as a measure of how effectively an ecosystem converts raw materials into living organisms, and is

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generally perceived to be a critical factor in ecosystem health.

The most important difference here is the unit of analysis. In traditional economics, productivity analysis is typically applied to a firm, industry or economy. Here, the analysis is applied to the business ecosystem. This is a crucial distinction, since, unlike industries, ecosystems capture the relationships between organizations in the product delivery chain. This enables one to balance what might be an adverse impact on one section of that chain (say, retailers) with a positive impact on other sections (say, distributors).

Robustness

A healthy ecosystem will be a robust ecosystem, promoting the survival of diverse firms and managing through the variety of inevitable disruptions. Robustness should thus be a key indicator of ecosystem health. Robustness may be measured in terms of firm survival rates. More sophisticated analyses focus on other factors like the stability of the core, the efficiency of reworking productive capacity to reflect changing needs, and continuity of experience for the consumer.

Many writings on technological innovation have focused on a firm's reaction to novelty as a threat that leads to catastrophic change. But in doing so, they have failed to capture the ways in which key firms can proactively influence these changes, offer solutions to multiple ecosystem participants, and improve the robustness of the ecosystem as a whole. There is strong evidence that networks with hubs are more likely to exhibit persistence of structure and predictability in the face of uncertainty, while also maintaining diversity. Keystones will thus effectively leverage the network to mount responses to new, uncertain conditions, and to promote the robustness of the whole.

Niche creation

Robustness and productivity do not fully capture the character of a healthy biological ecosystem; it is also important that these systems exhibit diversity. What matters most here is the capacity to create valuable new functions – in the ecosystem metaphor, the capacity to create valuable niches. And a direct way of measuring niche creation is to measure the extent to which valued new functionality is being created by new businesses and products.

In a healthy ecosystem, old niches need not persist. In the computing ecosystem, for example, decreases in diversity in some areas enable the creation of niches in others. This is consistent with the process through which new system-level capabilities arise in biological evolution: diversity at one level is reduced to create a platform that enables greater and more meaningful diversity at higher levels.

OPERATIONS STRATEGIES IN A BUSINESS ECOSYSTEM

As noted, viewing business networks as ecosystems suggests three roles that can be played by organizations in the way they influence ecosystem health and evolution: keystone, dominator and niche. We call these operations strategies, since they define a consistent pattern of operating decisions made by the organizations.

Keystone strategies

Examples of effective keystone strategies can be found in a variety of business environments. In software, several organizations have provided critical platform technology that has fueled a tremendous amount of third-party innovation. The most successful: Microsoft.

Since the early 1980s, Microsoft's operat-

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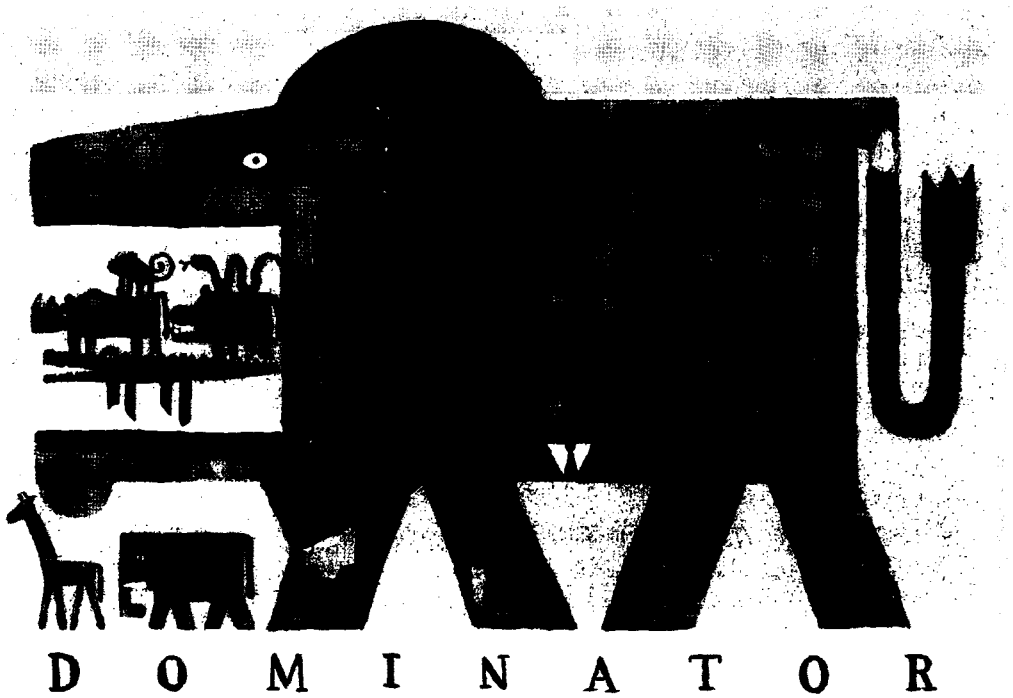

ing systems have enabled a community of independent software developers to write PC applications by leveraging capacities built into the operating system as well as by using special programming components and development tools created by the company. The operating system provided the hub through which a vast variety of applications-software providers could connect to PC and other hardware makers without each having to master the specifics of each interface.

In other words, Microsoft promoted ecosystem productivity by constantly improving its tools and focusing massive resources on nurturing its community of developers and technology partners. It enhanced ecosystem robustness by rapidly incorporating technological changes like Internet browsing into its platforms, and by encouraging the diverse technology suppliers and application providers. It stimulated niche creation by designing its platforms to be extendable in a variety of domains like multimedia applications, and by promoting research and development in areas like broadband communications that could be leveraged by new niche players.

Others have played similar roles in very different industries, serving themselves by serving the ecosystem as a whole. Taiwan Semiconductor Manufacturing Corporation has exerted an enormous impact on the rapidly evolving community of integrated circuit designers by offering a comprehensive manufacturing platform that largely avoids the need for individual designers to worry about complex manufacturing issues. And it has worked with semiconductor design tool companies to offer the industry tools to run on Taiwan Semiconductor's processes.

Or consider the role of Wal-Mart's Retail Link, which delivers real-time sales information to its suppliers. In many ways, Retail Link

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played a role analogous to that of Microsoft's programming platforms, becoming a supply-chain hub that connected manufacturers like Tyson Foods and P&G to the retail channel without requiring them to connect to individual stores. Wal-Mart provided the tools and technological components that enabled its myriad supply-chain-network partners to make Retail Link an integral element in their own supply chains.

To this day, Wal-Mart remains the only source of virtually instantaneous retail data for a large community of suppliers. By providing this data, as well as through other contributions – centralization of its supply-chain structure, numerous operational-efficiency improvements and cost reductions achieved through aggressive use of suppliers throughout the developing world – Wal-Mart effectively provides a low-cost, information-rich platform for retail distribution. And its essential keystone role goes a long way to explaining Wal-Mart's position as industry leader.

In general, keystone strategies are founded on three technological foundations: hubs, components and tools. They enhance productivity by simplifying the task of connecting network participants and by making the creation of new products by third parties more efficient. They increase network robustness by investing in and integrating new technology, and by providing a reliable reference point and interface for other ecosystem participants. Finally, they encourage niche creation by offering the innovative technologies to a variety of third parties and by investing in new infrastructure.

Dominator strategies

As with keystones, dominator firms occupy critical hubs in their ecosystems. However, unlike keystones, dominators take over their ecosystems, eliminating other firms and often expanding into new markets they subsequently dominate or even eliminate.

Business history is fraught with firms that have played dominator roles. Examples range from the early days of AT&T to the more recent history of IBM and the Digital Equipment Corporation in the mainframe and minicomputer markets respectively. Each provided a comprehensive set of products and services for end-users, leaving no space for other organizations to leverage their services and enhance them with additional functions. In the early 1960s, IBM produced every technological component that went into its mainframes, and provided virtually every ancillary computing service from custom software applications to installation services to financing. DEC similarly leveraged internal components and services for its minicomputers.

To a dominator, technological innovation is an internal necessity – a hedge against potential competition. Thus, Bell Laboratories and the IBM TJ Watson Research Center were created to make sure their parent companies could never be blindsided by a competitor with superior technologies.

Dominators reduce diversity and robustness in the face of external shocks, leaving the entire ecosystem occupied by the dominator vulnerable to neighboring ecosystems that offer substitute functionality. If these competing ecosystems have healthier structures, the dominated ecosystem will likely fall. Such was the fate of both the mainframe and minicomputer ecosystems when the PC ecosystem began to provide comparable performance. The dominated ecosystems, each largely driven by the efforts of a single firm, simply could not compete with the combined efforts of the thousands of organizations linked by the PC platform.

This suggests that keystone strategies are

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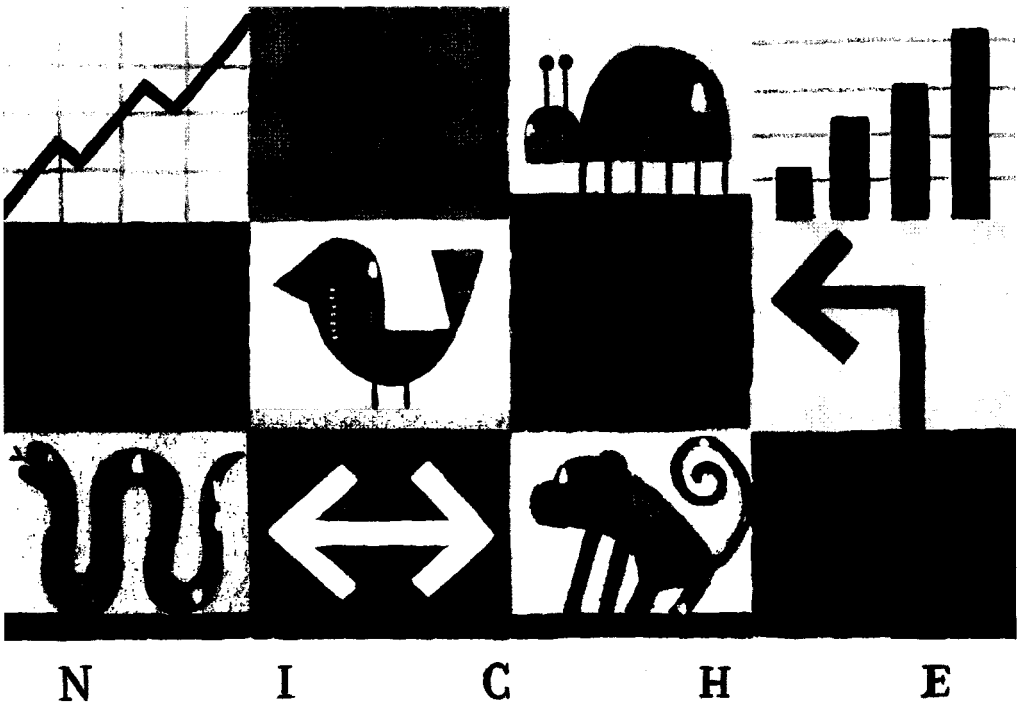

preferable to dominator strategies from the perspective of the economy as a whole since they are a more stable source of innovation in the long term and are more likely to foster productive new niches. Dominator firms may produce extraordinary returns in the short and medium term, but they eventually open the ecosystem to massive dislocation.

In the case of both mainframes and minicomputers, neither ecosystem threatened the other. But when the PC ecosystem, with its vastly more productive and innovative keystone structure came along, both collapsed – and virtually simultaneously.

This contrast between dominators and keystones suggests one particularly clean way of distinguishing between the two. Both strategies can increase the number of niches occupied by a firm, but with a critical difference: when a keystone firm adds to the niches it occupies, it also increases the total number of niches in the ecosystem. Dominators, on the other hand, spread their reach at the expense of the ecosystem as a whole.

Niche strategies

Niche players would at first glance appear to be the least influential members of an ecosystem, but that is not always the case. In addition to being the most numerous members of the ecosystem, they are often positioned at the fringes of the network where innovation is actively being pursued and new markets explored. These edge firms are critical to the health of the ecosystem because they are the locus of the diversity that protects the system from trauma.

Examples of effective niche players are numerous. Nvidia and Intuit are well-established players, and occupy well defined turf in their industries – graphics accelerators and personal accounting software respectively.

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Examples of players that are currently opening new niches include Groove Networks (peer-to-peer applications) and Mobilian (wireless communication).

The core advantage of a niche player is focus. It would be folly for Intuit to squander resources on the technical details of dial-up networking (Microsoft's concern), or for Mobilian to invest precious cash in manufacturing facilities (as Taiwan Semiconductor does). Their advantage resides in the ability to nurture capabilities unique to their niches.

REGULATION AND THE ECOSYSTEM METAPHOR

The economic case for regulating trade practices rests on the classic insight that consumers' interests will be maximized if prices reflect costs. But considerations of dynamic efficiency – notably, the generation of optimal rates of technological change – undermine the straightforward conclusions about market regulation that seemingly follow. In a networked context, these considerations are further complicated by the fact that efficiency is a function of the collective performance of a large number of organizations.

In the landmark Microsoft antitrust case, prosecutors focused on the concern that network economies had created daunting barriers to entry for competitors with alternative technologies. Both the Clinton Administration's plan for breaking up the company and the dissenting states' regulatory plan reflected attempts to patch up traditional economic analysis and apply it to a context for which it was never intended.

The ecosystem metaphor – and in particular, the distinction between keystone and dominator strategies – offers a very different way of looking at the Microsoft case. In an environment in which innovation largely drives consumer welfare, what counts most is the vitality of the broader industrial ecosystem and the effect of central actors on its productivity, robustness and niche creation. The evidence suggests that Microsoft has pursued keystone strategies that have benefited the computing ecosystem as a whole.

These began with the first popular microcomputer software compiler, introduced in 1976, and continued over the next quarter century with a series of common tools, platforms and application components, now leveraged by millions of developers around the world. Even Microsoft's very real threat to the survival of some members of the ecosystem may in fact enable more meaningful and extensive diversity elsewhere in the ecosystem – making it easier and cheaper to write software applications. For example, some estimate that the cost of writing applications that work well on two different browsers may add as much as 30 percent to development costs. We would argue that an analysis of these effects may be at least as important as the more traditional antitrust arguments that were made during the trial.

The ecosystem framework also suggests that the formal market definition in the Microsoft case is of little relevance. The Justice Department asserted that the relevant market for purposes of assaying monopoly power was PC operating system software. Microsoft failed to convince the judge that the relevant market was the broader market for applications software platforms, which included everything from the Mac operating system to the Sony PlayStation 2 to Sun Microsystems' Java programming platform. Yet from the ecosystem perspective, both arguments offer an incomplete perspective. What ought to matter is the health of the computing environment affected by Windows, from technology provi-

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ders to system consultants, and from corporate information technology departments to consumers.

The ecosystem alternative to the path-dependence metaphor can inform a variety of emerging policy issues. An example is the current debate over nascent efforts to promote open source software at the expense of proprietary software. To many analysts, the notion of software created by a loose organization of volunteers and freely subject to change by users offers a means to liberate the computing world from Microsoft's grip. Indeed, some open source software – the Linux server operating system, the Apache e-mail server – has made great headway against commercial alternatives. And from Germany to Peru to Korea to China, governments are promoting public and private use of open source as a way to create competition for the commercial software establishment.

There might be a plausible rationale for this approach if classic market power in a bounded market were, in fact, the core concern. But it is more problematic when viewed through the ecosystem lens. Is the computing ecosystem really likely to be more innovative and more robust in a world in which explicit government policy causes Microsoft to lose some of its leverage as a keystone? And is open source truly that different, when viewed from the perspective of its broader ecosystem and its own emergent keystones, IBM and even Sun? Perhaps it may be better to let the platforms compete on their own terms, and let the broader markets assess their relative propensities for enhancing productivity, robustness and niche creation.

More generally, there is a case to be made that policies inhibiting the development of keystone firms can undermine technologically driven growth. The impact can be very significant. During the dot-com implosion, firms suffered from the absence of effective keystones to promote the real productivity of the many new niche players. In contrast, the PC ecosystem prospered through the growth (albeit slow in comparison) in productivity and impact of its vast and prosperous community of applications developers.

Niche firms are the locus of precisely the kind of meaningful diversity that protects the system from trauma.

A LAST WORD

The ecosystem metaphor is just that – a metaphor. Arguments that rely upon it are no stronger than the evidence used to buttress them. That said, it offers a powerful framework for analyzing the complex interdependencies that are becoming increasingly common in modern economies. In particular, they should serve as counterpoint to simple path-dependency and switching-cost arguments.

Regulators are correct that the nature of the industrial environment is changing and that regulatory frameworks based on 19th century models of industrial organization are losing relevance. But competing models of how this new environment works are just beginning to be constructed. And it would be foolish, indeed, to fill the vacuum with a new rationale for aggressive government intervention before the evidence is in. M

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Welfare

A Fix for

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Reform All Seasons?

By Sheldon Danziger

The 1996 Personal Responsibility and Work Opportunity Reconciliation Act has been acclaimed as the source of the most successful social policies of the past three decades because, to paraphrase former President Bill Clinton, the law "ended welfare as we knew it." But only now is it being tested under less-than-ideal economic conditions.

Much of the reform's success in moving millions from welfare to work is due to its serendipitous coincidence with an economic boom that eventually drove unemployment rates well below levels previously thought to be sustainable without triggering inflation.

The act also gave states a financial windfall. It changed how states fund benefits from a matching grant formula that added federal funds whenever caseloads increased (e.g., during a recession) to the awarding of block grants whose size was not sensitive to economic conditions. Thus, in the five boom years following reform, the block grants allowed states to reduce their own welfare spending below pre-reform levels, but to continue to receive the same amount of federal funds.

Now that the economy is in recession – albeit a mild one in most places – problems have emerged: the block grant windfall has

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evaporated, and it is both more difficult for the less-skilled to find work and more difficult for states to fund a safety net. For the first time in recent history, single mothers who are willing to work may be denied cash assistance even as job opportunities are shrinking because welfare reform's time limit and other rule changes have made it more difficult to access the cash safety net.

Congress is now debating the required reauthorization of the 1996 law. However, it has yet to grapple with the looming need for greater cash assistance and the fiscal crunch faced by the states. Neither the House bill, which passed last spring, nor the Senate Finance Committee bill, which is scheduled for debate this fall, reflects the reality that states will have a harder time maintaining work levels among recipients with the economy heading south. Indeed, both bills call for states to increase the percentage of welfare recipients who are at work beyond what was achieved during the economic boom, and there is no contingency for relaxing this obligation in the face of higher overall unemployment rates. Congress seems to be assuming that welfare recipients will always have the good fortune to be looking for jobs in a labor market with a 4 percent unemployment.

Whether or not Congress chooses to address these pressing issues this year, it will be crucial in any effort at further reform that both the weaknesses and the strengths of the existing law be clearly understood.

WHAT WAS ACCOMPLISHED AND WHAT WAS NOT

In combination, welfare reform and the 1990s boom economy achieved several goals. Caseloads declined, more single mothers are working, poverty has fallen, and the federal and state governments have increased spending to supplement low earnings and to fund childcare plus other work incentives. However, a substantial minority of welfare recipients has serious personal problems that have kept them from working steadily even during an economic boom. Moreover, in each domain in which successes have been recorded, the recession poses challenges. Caseloads have risen in most states in the last year while the employment rate of current and former welfare recipients has declined. Yet even as economic hardship is driving the marginal workforce back toward welfare, states are facing budget shortfalls that are not conducive to social generosity.

Welfare as a Lifestyle Alternative is Gone

It is no longer plausible to claim that welfare provides an alternative to working as a way of life. The old Aid to Families with Dependent Children program (AFDC) had evolved since its inception in 1935 to provide cash assistance to all who met state and federal eligibility criteria. Benefit levels were set by the states, but total costs for this entitlement program were shared between the states and the federal government. The Temporary Assistance to Needy Families program (TANF), which replaced AFDC, gives states discretion in setting eligibility criteria, work requirements and other program rules. Each state is free to decide which families to assist, subject only to a requirement that all receive "fair and equitable treatment."

TANF reduces the likelihood that a single mother can choose to remain on welfare. Even if she finds that the benefits (economic and psychological) of working do not exceed the costs, she can only receive cash assistance

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if she works, does community service or participates in other qualifying activities. Those who refuse to search for work or to cooperate with the welfare agency can lose both cash assistance and food stamps. States have made additional changes in regulations that make it harder to join the assistance rolls and harder to stay on them in both good and bad economic times. In addition, the imposition of a 60-month lifetime limit on the use of federal funds for welfare benefits increases pressure to enter and to remain in the labor force.

This new administrative toughness went into effect in the middle of a long economic boom. The unemployment rate for female family heads fell from 9.6 percent in February 1994 to 5.0 percent in December 2000. As a result of both the new rules and the increased availability of jobs, caseloads dropped dramatically. Between early 1994 and late 2000, the number of welfare recipients fell by more than half, to about the same number as in 1968.

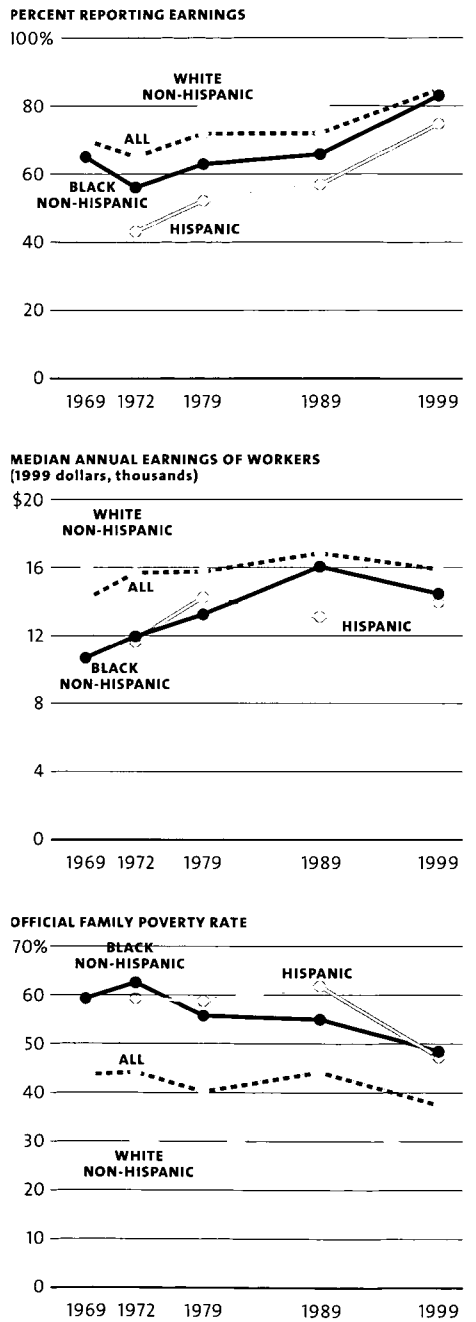
Now the tide has turned. Between December 2000 and July 2002, unemployment of female household heads increased from 5.0 percent to 8.4 percent. By no coincidence, welfare caseloads increased in most states for the first time since they began to fall in the mid-1990s. Thirty-four states had higher caseloads in March 2002 than in March 2001.

But because of the post-1996 welfare rule changes that toughened eligibility requirements, caseloads have not climbed as rapidly during this recession as during the last. This means that, in the midst of a recession, some needy families are receiving neither unemployment insurance nor welfare benefits.

Single Mothers are Working More

Greater numbers of single mothers entered the labor force after the mid-1990s. From the late 1960s to the late 1980s, about 70 percent

TRENDS IN WORK, ANNUAL EARNINGS AND POVERTY, SINGLE MOTHER FAMILIES WITH CHILDREN, 1969-99



SOURCE: March Current Population Computer Tapes

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of single mothers with children under age 18 worked for some portion of the year. With the economic boom and welfare reform, this figure increased to 85 percent.

Note, too, that increases in employment were greatest for the racial and ethnic groups that relied most on welfare. Between 1989 and 1999, the employment of white single mothers increased by 9 percentage points. That of black single mothers rose by 17 percentage points while that of Hispanic single mothers rose by 18 points.

Numerous evaluations of work among current and former welfare recipients in the aftermath of the 1996 reform show that, in any given month, about two-thirds were at work. For example, in the Women's Employment Study conducted by the Poverty Research and Training Center at the University of Michigan, a random sample of mothers who received cash welfare in February 1997 were interviewed four times between fall 1997 and fall 2001. Between early 1997 and fall 1999, the percentage of respondents working at least 20 hours a week at the time of the interview increased from about 40 percent to 67 percent. Since then, the trend has reversed, though only modestly. By fall 2001, the percentage working had slipped to 63 percent.

As the employment rate leveled off, so did the percentage of respondents who received cash assistance. All respondents received assistance in February 1997; the percentage then fell to about 75 percent, 50 percent and 30 percent in fall 1997, fall 1998 and fall 1999, respectively. In fall 2001, the figure remained at 30 percent.

Over this four-year period, the average current or former recipient worked in about two-thirds of all months. On the one extreme, about 29 percent of the group worked in at least 90 percent of the months; at the other, about 15 percent worked in less than one-third of the months. Respondents were defined as experiencing job instability if they went through at least one transition between work and non-work or reported an involuntary job change (i.e., were laid off or fired). About half experienced job instability between fall 1997 and fall 1998; about two-fifths did between fall 1998 and fall 1999.

The extent of employment instability and the pervasiveness of part-year work among the employed make it likely that most of these women will not qualify for unemployment insurance if they are laid off during a recession – the program is not designed to cover the occasionally employed. Moreover, as discussed below, those who worked least during the boom are at greatest risk of falling through the safety net during the recession; the women who worked in less than a third of the months during good times include those most likely to reach the new federal time limit for welfare eligibility.

The Anti-Reform Critics Were Wrong

The increase in poverty predicted by critics of the 1996 law has not occurred, even though most former recipients are working less than full-time and less than year-round, and earn relatively low wages. This fact reflects a variety of changes in state and federal policies for the working poor that were implemented in the mid-1990s and that helped current and former recipients achieve higher net incomes.

After four months at work under the old AFDC program, a recipient's welfare benefits were reduced by about one dollar for each dollar earned – the equivalent of a confiscatory marginal tax rate. Policy analysts from both the left and right had long decried this "welfare trap." In response to the greater flexibility allowed by the 1996 law, many states increased the net financial rewards for mov-

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ing from welfare to work. About two-thirds of the states increased earnings "disregards," which allow recipients to have some earnings that do not offset welfare benefits. For example, in Michigan, the first $200 in monthly earnings and 20 percent of earnings beyond that do not reduce the welfare benefit. States have also increased spending on childcare for current and former recipients – in some jurisdictions, more is now being spent on childcare than on cash assistance.

Federal policy changes outside of welfare have also increased the benefits linked to moving from welfare to work. The hourly minimum wage increased from $4.25 to $5.15 in 1997. A major expansion of the Earned Income Tax Credit (EITC) increased the maximum credit (paid in cash) from $950 in 1990 to $2,428 in 2001 for a family headed by a low earner with one child, and to $4,008 for those with two or more children.

David Ellwood of Harvard's Kennedy School of Government calculates that a hypothetical single mother who moved from being a nonworking welfare recipient to a full-time worker earning the minimum wage would have increased her net income in a typical state by only $2,005 (24 percent) in 1986. A decade later, the net increase would have been $7,119 (95 percent). This additional gain from taking a job resulted from the combination of a decline in inflation-adjusted welfare benefits, the beefed-up EITC and an increase in the level of childcare subsidies available to low-income working mothers. Also, in 1986, it was likely that both the recipient and her children would have lost medical coverage when she left welfare because many jobs that recipients take do not provide employer-subsidized insurance. In 1996, only the mother would have lost coverage, and then only after a transitional year on Medicaid.

By the same token, the State Child Health Insurance Program of 1997 and changes in Medicaid policies further expanded health insurance coverage so that jobs not providing

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subsidized insurance are now more attractive to those on welfare. States are at liberty to cover low-income working parents even without a recent connection to cash welfare and can establish income limits for Medicaid eligibility that are much higher than in the past.

Thus by the end of the 1990s, going to work was less likely to leave a mother and her children uninsured than in the past. Nonetheless, in the Women's Employment Study, about one-third of those who left welfare for work still lacked health insurance for themselves in fall 1999.

The combined effects of the economic boom, welfare reform and these other policy changes contributed to the first large decline in child poverty in 20 years. The official measure of poverty among the young (which does not count EITC benefits or food stamps) rose from 14 percent to 23 percent between 1969 and 1993, but fell back to 16 percent in 1999. Poverty also declined for single-mother families with children. Between 1989 and 1999, the rate fell from 44 percent to 34 percent for all single-mother families. The figure declined by about 6 percentage points for white and black single mothers and by about 15 points for Hispanic single mothers.

The Michigan study (WES) further buttresses the evidence that it now pays to move from welfare to work. Women who worked in most of the months in 1998 without receiving cash assistance had both much lower poverty rates (49 percent) than those who were nonworking welfare recipients for most of 1998 (88 percent), and much higher average incomes relative to the poverty line: 112 percent versus 56 percent.

Poverty remains high because single mothers, on average, do not earn much more than the federal poverty line. At $16,000 in 1999, the median earnings of single mothers were not significantly above the $13,423 figure for that year's poverty line for a mother and two children. Putting these figures in perspective, even if poverty for children in these families was to continue declining at the pace of the last decade, it would be many years

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before the rate fell to current levels of poverty in Canada and Western Europe.

A Significant Minority Aren't Making the Transition to Work

A minority of welfare recipients (though in absolute terms, a large number) worked very little over the four years examined in the Michigan study. Many of the welfare-stayers seem to have had difficulty getting and keeping jobs even during the economic boom, probably because they have low educational levels, few marketable skills, little work experience, and significant physical and mental health problems.

WES documents the extent to which multiple personal problems contribute to low earnings for many recipients and to unstable employment for others. The study measured 13 potential employment barriers, many of which are not differentiated in the data that the U.S. Census Bureau and Bureau of Labor Statistics use to analyze trends in employment. These barriers include limited job skills, physical and mental health problems, and experiences of domestic violence.

The Michigan study documents a strong negative correlation between the number of barriers and the amount of work. For example, among the 29 percent of respondents who worked in 90 percent or more of the months between February 1997 and fall 2001, the mean number of barriers measured in fall 1997 was 1.7 (out of 13); for the 15 percent who worked in less than one-third of the months, the mean number was 3.9.

Consider job skills. Women who had performed fewer than four of nine standardized basic job skills on prior jobs were considered to have skills problems. In fall 1999, just 14 percent of respondents who were working and not receiving cash assistance faced this barrier compared to 36 percent of those who were nonworking, welfare recipients. The study also found that 10 percent of the work-reliant met the diagnostic screening criteria for post-traumatic stress disorder compared to 23 percent of those reliant on welfare.

The welfare-to-work programs adopted by most states after the 1996 reform emphasized rapid labor-force entry and did not screen recipients for personal problems or offer services to address them. But a few states have developed programs that use trained staff or standardized instruments to identify a range of problems and provide treatment for mental health and substance abuse problems. For example, Utah screens welfare clients for a number of barriers. If the screening indicates a possible mental-health or substance-abuse problem, the client is seen by a social worker who administers further diagnostic tests and makes appropriate referrals.

Of course, screening for such problems is only a beginning. A 2001 U.S. General Accounting Office study found that even in the atypical counties using formal assessments to identify problems, less than half of clients assessed as needing services actually received them.

The Five-Year Time Bomb is Ticking

While recessions always increase economic hardship, problems for current and former welfare recipients are likely to be more severe in this recession than in the last (1990-91) because of the five-year, lifetime limit on the receipt of cash assistance. Many women who have not been able to get or keep jobs during the boom are now at risk of becoming ineligible at a time when the unemployment rate for female household heads exceeds 8 percent. These women face more barriers to employment than those who left the rolls in the late 1990s. It is likely that they have spent so much time on welfare during the last five years

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because they were unable to work steadily even when employers were scrambling to fill vacancies. They are even less likely to find steady jobs now that many firms are reducing their workforce. Many former welfare recipients had jobs in the service industries that have been especially hard hit and have shed hundreds of thousands of workers in the aftermath of September 11.

Research by Harry Holzer, an economist at Georgetown University, suggests that less than two-fifths of former recipients who lose their jobs will qualify for unemployment insurance. Relatively few former welfare recipients meet eligibility requirements because they did not accumulate enough work experience before the current or previous quarter or earn enough on their jobs, or because they left a job to care for children or other family members. In prior recessions, a greater percentage of these unemployed workers who could not qualify for unemployment insurance would have re-qualified for cash welfare.

The new formula gave states a financial windfall.

States Bear the Financial Risk

The 1996 law changed the federal-state funding structure for cash assistance that had been in place for six decades. Instead of matching state expenditures on cash assistance, TANF provides a fixed block grant that does not change with demand or economic conditions. The states' grants are based on a formula that takes into account historical federal spending on welfare in each state. Under the prior law, federal welfare spending fell during booms and increased during recessions. Now states must deal on their own with the increased demands for welfare coverage caused by recession or even by population growth.

In the first five years after reform, the new formula gave states a financial windfall – as caseloads fell, federal spending remained constant, but state spending was allowed to decline. A "maintenance of effort" provision (MOE) requires states to maintain their own welfare spending at a level equal to or greater than 80 percent of their pre-welfare spending or risk penalties of reduced federal funding. States that increase work or reduce caseloads enough to meet the act's work-participation requirements can drop their spending to 75 percent of historic levels; most states are at this MOE level.

Because of the post-reform windfall, many states increased childcare subsidies for welfare recipients and the working poor as well as spending on other services for welfare recipients. But the current recession has already stretched state budgets, and further caseload increases may tempt states to shift money away from such subsidies. If that happens, former recipients who manage to keep their jobs as well as those who have to come back on welfare will be worse off financially.

The 1996 law set aside $2 billion in contingency funds for states to use when their unemployment rates increased substantially. However, the contingency fund authorization expired in September 2001 without having been tapped. In part, this was because triggering fund outlays required very hefty increases in a state's unemployment rate. Even if the triggers had been activated, states would have been obliged to increase their own state spending – from 75 percent of their historic spending back to 100 percent of that level –

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before they could have used the added cash.

WELFARE REFORM: ROUND TWO?

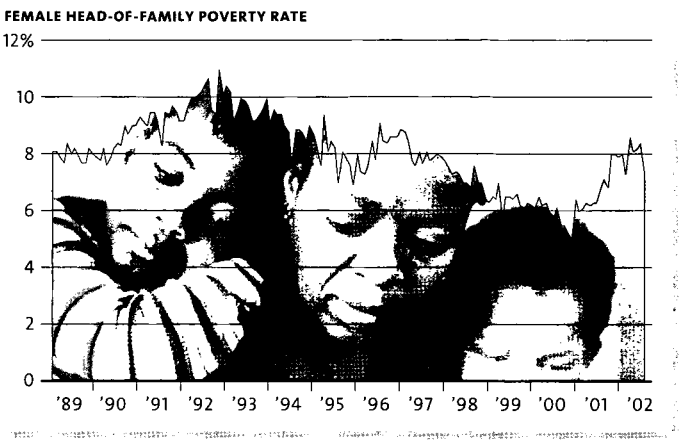
When candidate Bill Clinton made welfare reform a priority during the 1992 campaign, he called for a reduction in poverty as well as a reduction in welfare caseloads and an increase in work with the slogan "make work pay and end welfare as we know it." However, by 1994 the slogan had been shortened to "end welfare as we know it." The current Congressional reauthorization debate maintains this narrower focus. Much attention has been paid to changes that would increase the amount of work required from welfare recipients – and little to the fact that, even after a long economic boom, the poverty rate of single mothers remains very high. Now that the impact of welfare reform during a recession is becoming evident, Congress has an added responsibility to tackle the larger goal of not only transforming welfare but also making work pay.

Welfare recipients who have no serious personal impairments should be required to look for work, even when the economy is in recession. However, if they diligently search without finding jobs, government should assume some responsibility for helping them. For example, recipients who have reached time limits or who cannot meet work requirements could be offered an opportunity to perform community service in return for cash assistance.

A more costly option – but one with a greater anti-poverty impact – would be to provide low-wage public service jobs of last resort. Welfare recipients who are willing to work could then combine wages with the Earned Income Tax Credit and support their families, even when there is little employer demand for their skills. For recipients with debilitating personal problems, there remains a need at all stages of the business cycle to expand social service and treatment programs and to experiment with supported work or other forms of transitional job assistance.

If the gains from welfare reform are to be sustained during a recession, additional funds will be needed to complete the task of turning a cash-based safety net into a work-oriented safety net. The contradiction, of course, is that the need for additional funds is greatest during recessions when state revenues are falling and when most states are struggling to meet their legal obligation to balance their budgets. This means that Congress must either provide increased funds to states to fund work requirements that do not vary with the business cycle, set work requirements that vary across the business cycle, or encourage states to reform their unemployment insurance systems to be more responsive to the labor market experiences of low-income single mothers.

BACK TO THE FUTURE



SOURCE: U.S. Bureau of Labor Statistics

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The Origins of Terror

Implications for U.S. Foreign Policy

The Milken Institute Review

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TED THAI/TIMEPIX

By Jennifer Bremer and John D. Kasarda

In the wake of 9/11, many have pointed to third world poverty as a primary driver of terrorism. While poverty has certainly contributed to the rejection of the West across parts of the Muslim (and non-Muslim) world, we believe it is not the central cause of such rejection.

Modernization, not poverty, is terrorism's source. While modernization is an overwhelmingly positive phenomenon, offering the only route to rising living standards for billions of people, it also plunges nations into an economic, political and social maelstrom that weak governance institutions are rarely able to contain. If we are to win the war on terrorism, we must recognize that it is not the poverty of the third world, but our shared failure to manage third world countries' transition out of poverty, that is endangering our nation as well as theirs.

Such understanding begins with recognition of the very new challenges posed by what we term the New Second World. This group of countries includes approximately three dozen nations that have reached middle-income status over the past two decades and that are now in the midst of the critical economic and political transitions from the third world to the first.

The New Second World transition has three phases. The first, or early phase, typically begins when a low-income country starts to industrialize rapidly, launching an agrarian-industrial transition and the complex transformations – urbanization, income growth, economic diversification – that accompany it. During this phase, incomes remain in the lower middle ranks. If, however, growth continues for a decade or more, the country reaches the middle New Second World phase. Industrial production per capita may now be around three times what it was when the transition started, and growth in low-value-added manufacturing is rapid and sustained. Incomes rise and a middle class begins to emerge. The future looks extremely promising at this stage, and the country seems to be well on its way toward first world status.

If this middle phase continues for 10 to 20 years, the country reaches the third, advanced New Second World phase. This phase is often a time of recurring economic crises and political turmoil. But properly managed, it does indeed complete the transition to first world status.

Countries currently in this advanced group include perhaps a dozen

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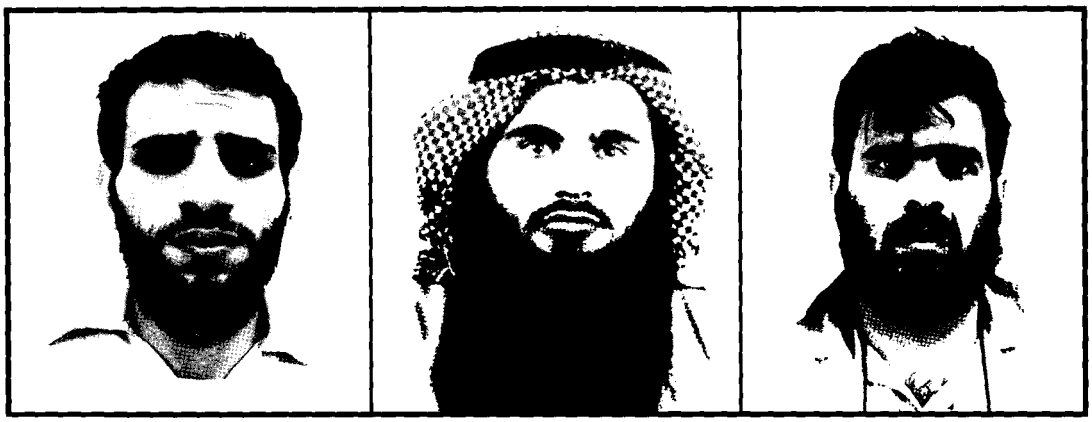
nations, among them Brazil, Poland, Russia and Turkey, that have left behind their third world past of dictatorship, isolation and agrarian poverty. They face a first world future that promises prosperity and democracy, economic growth, and increasingly global trade. But to get there, they must overcome daunting institutional challenges.

status. Although they started the transition at about the same time as many of the advanced New Second World countries, this group has failed to move forward to the middle stage largely because of growth-limiting policies and institutional rigidities. History suggests that failure to make steady progress through the New Second World transition's early phase to the halcyon middle period is



Terrorists of today: members of Al-Qaeda

Right behind this group are a handful of countries enjoying the New Second World's go-go middle phase. These include two countries of great geopolitical significance: India and China. They have moved beyond the launch stage into full-scale industrialization. Growth, while uneven, has brought rising incomes to hundreds of millions. But rapid growth has also masked serious structural problems that must be addressed if they are to continue their move forward.

A third group is still in the early phase of the transition. Countries like Egypt, Iran and Saudi Arabia have reached middle-income

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extremely dangerous. If the transition stalls here – as it did in post-World War I Russia, and as it has now in much of the Middle East – failure can lead to revolution and Al Qaeda-style international violence.

Together, the three groups forming the New Second World possess the economic scale and political scope to redefine global affairs. At the same time, the development processes going on within them generate stresses capable of endangering other nations, rich and poor. Even carefully managed, such stresses will periodically push these countries off the growth path, creating recurrent crises. But when the stresses of development are seriously mismanaged, especially in the early phase, these countries provide all the ingredients for a brew that cooks up into a powerful mix of economic stagnation, despair and

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criminal violence.

The emergence of the New Second World tests the ability of first world leaders to respond to the root causes of this condition – to recognize and then to deal with the threats to stability. Here, we build the case for a more active response to the challenge. We explore why the test is critical to U.S. leadership and why it constitutes a defining foreign policy hurdle for the post-Cold War, post-9/11 world.

Throughout the article, we refer to "choice-based" systems, a term that encompasses both market-based economies and democratic political systems. Along both dimensions, the fundamental organizing principle in a choice-based system is decision-making by private individuals and organizations, rather than governments. Choice-based systems aggregate these individual decisions through a transparent system of laws and institutions that guide actions in the political and economic realm. Choice-based systems stand in contrast to command-based systems, in which economic and political decisions are made from the top down. Totalitarian communism and Islamic extremism both epitomize command systems, seeking to impose central control over all societal, economic and political decision-making and to minimize the scope for individual choice. The establishment of choice-based systems has always been a stated principle of U.S. foreign policy. The fundamental foreign policy objective in the coming decades should be to expand the community of nation-states relying on choice-based systems. Implanting democracy and market-led development, especially in countries in the early phase of the New Second World, is the only way to attack the origins of terrorism.

WHAT IS THE NEW SECOND WORLD?

New Second World countries cannot be understood either as well-off third world nations or as poor cousins within the first world. The first world countries passed through their own transition, the majority moving forward as a bloc from agrarian economies ruled by narrow elites into diversified industrial economies governed as democracies. Although such a major transformation cannot be dated with precision, the century from 1850 to 1950 saw the main building blocks put into place. Urbanization and industrialization fueled rising incomes,

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corporations emerged to manage ever-more-complex economic activities, and the key institutions of democracy and macroeconomic management gradually displaced the back-room politics, pervasive corruption, and boom-and-bust cycles of the transition.

The economic hallmarks of New Second World status are periodic rapid growth coupled with industrialization, economic diversification and urbanization. New economic elites challenge traditional agrarian power. The emerging middle class drives a more inclusive and transparent political process and civil rights become a reality for the vast majority. The development of core governance institutions – from central banks to enforced civil rights laws – consolidates the gains and lays the basis for further growth.

We forget that our own transition was very rough going and was by no means certain to succeed.

We forget that our own transition was very rough going and was by no means certain to succeed. Indeed, some nations, like Russia, failed to make the transition, while others, like Germany, collapsed with horrifying global impact. No nation made the transition without serious crises, economic and political. In the first transition wave, countries now making up the first world were forced to find their way without a map. Between 1850 and the present, only one major nation – Japan – made it far enough to join Europe and America in the first world.

But the dynamic of development changed dramatically in the 1980s and early 1990s, when more than a dozen countries began to industrialize rapidly. Their economies enjoyed sustained annual growth rates of 5 percent or more that enabled them to reach levels of scale, diversification and institutional sophistication comparable to Europe and North America in the early 20th century. They have found the road more than a little bumpy, but have clearly made it out of the third world.

While the the taxonomy of the advanced-phase New Second World may be debated, any list would have to include the ASEAN five (Indonesia, Malaysia, the Philippines, Singapore, Thailand), the Mercosur leaders (Argentina, Brazil, Chile), the advanced central European nations (Czech Republic, Hungary, Poland), and a number of others – notably Korea, Mexico, Russia, South Africa and Turkey.

An even larger group of early and middle New Second World countries stand in line behind them. If both India and China sustain their current growth during the coming decade, they will enter the difficult advanced stage. Next in line are perhaps two dozen other countries. Some appear well on their way toward the halcyon middle phase.

Another large group, however, remains stuck in the early phase. If they are able to embrace choice-based economic and political management, they should be able to move into the middle phase. This diverse group might include Egypt, Iran, Nigeria, Pakistan, Romania, Saudi Arabia and Venezuela – even perhaps a reformed Iraq or Cuba.

The success of this transition is no more assured than was that of the earlier period. To the contrary, many of the nations stuck in the early phase have proven unable to put their command-based pasts behind them and to

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embrace the choice-based systems that underpin growth. Unable to progress into the rapid-economic-growth middle phase, they are in an unstable position that endangers both their progress and our security.

China and India, which have reached this middle stage, must be watched especially closely as they approach the advanced phase. Their passage could set immense destabilizing forces to work within countries that are nuclear powers, that together account for a third of the world's population and that share a long history of hostilities within the region. It is difficult to imagine a New Second World crisis in Mercosur leading to war between Argentina and Brazil, for example, but an economic collapse in China leading to military adventurism and global crisis is frighteningly plausible.

DISTINGUISHING FEATURES OF THE NEW SECOND WORLD

Although no country fits the profile exactly, clear differences set off the New Second World from either the first or the third world. The experience of the OECD countries suggests that the transition process is bimodal, with periods of crisis in the early and advanced phase, separated by a middle period of rapidly rising prosperity. The early phase is often accompanied by significant instability, as old and new powers fight for control and emerging choice-based models contend with the established command-based systems. This instability can derail the process entirely, as is happening today in much of the Middle East. But many countries make it through to the boom years of the middle phase.

As this growth process matures, however, it outstrips the limited capacity of the country's governance institutions and a second set of crises strike. This typically begins in the financial sector, but spreads to become broader economic and political crises. They may become severe as the advanced stage proceeds, driven by a worsening imbalance

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between a rapidly growing industrial sector and a weak, ill-regulated service sector.

Economic Characteristics. Given a reasonably permissive macroeconomic environment and a cooperative government, an entrepreneurial private sector can achieve very high rates of manufacturing growth and can sustain it for a decade or more. This is precisely what happens in a New Second World country as it moves into the middle phase. Eventually, though, rapid growth becomes unsustainable without a strong service sector – stable financial institutions, reliable power and telecommunications, and reliable transportation.

The weak government institutions of the New Second World impede the emergence of the strong service sector needed to sustain growth. None of the critical service industries can be built without the active engagement of both public and private sectors. Regulators have to be as skillful and responsive as the private-sector banks, power companies and telecommunications firms that they regulate. And this is where the late-stage of the transition runs into trouble.

Building the institutions and sophisticated regulation that the service sector needs is never easy. It is doubly hard with the weak government of a country newly emerged from the third world – and typically impossible in a dictatorship. Given a weak service sector, continued growth of the industrial sector eventually becomes untenable as well.

The demands on a weak service sector are particularly unmanageable in countries integrating rapidly into the global, choice-based economy – a process that is now an essential element of advanced industrialization. To play in this league, a New Second World country must put on Thomas Friedman's "golden straitjacket" all at once, responding to global markets that are much more complex and demanding than those faced by America and Europe in the early 20th century. While the global environment can be greatly beneficial to these countries, it also places strenuous demands on services. Their banks might have fit in quite naturally with American and European counterparts in the global economy of the early 20th century, but the financial markets of the early 21st century are another matter.

If this were a perfect world, New Second World governments would recognize their institutional capacity had fallen behind. And powerful economic interests, seeing the need for a well-regulated, competitive marketplace, would gladly accept stronger governance and reporting requirements. But in light of the United States' own experiences, from the panics of the 1870s to the collapses of Enron and WorldCom, U.S. leaders should not rush to condemn the failings of New Second World economic managers.

Political Characteristics. The New Second World phase generally displays greater variance in its political features than in its economic structures. Chile under Pinochet and China under Deng were able to industrialize rapidly without abandoning command-based political systems. Conversely, India shows many democratic features, while retaining numerous command-based aspects in its economy. These imbalances tend to diminish with time; most advanced New Second World countries are soundly democratic.

The relationship between political and economic development remains complex. It may be no coincidence, for example, that India's turn toward economic reform has been accompanied by the shift from decades of Congress Party dominance to more competitive, multiparty contests. The contrast between democratic Thailand's very real

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progress on reform after voters rejected the government that mismanaged the 1997 crisis and the chaos that overran Suharto's Indonesia demonstrates that democracy and economic reform can be mutually supportive.

Despite the benefits of the transition, it often brings wrenching social displacement. Old agrarian and new industrial interests contend for power, for example, as in our own Civil War. The equivalent political transition in the United States saw three presidents (Lincoln, Garfield and McKinley) assassinated within a 40-year period.

The financial crises of the advanced New Second World countries can be as dramatic and destructive as the Great Depression … but they are also powerful drivers of reform.

WHEN THE NEW SECOND WORLD TRANSITION FAILS – THE ORIGINS OF TERRORISM

The financial crises of the advanced New Second World countries can be as dramatic and destructive as the Great Depression or the current collapse in Argentina, but they are also powerful drivers of reform. Properly managed, late transition crises move countries forward to first world status.

No such benefits flow from the early New Second World crisis point. When countries start the transition from third world status but fail to provide adequate governance, market-based growth cannot be sustained. In this early stage, major transformations threaten traditional structures, but the new structures that will supplant them are not yet in place. A stalled transition in this early stage therefore generates stresses that can be extremely destabilizing. Indeed, this is terrorism's wellspring.

The early phase typically begins with the emergence of a private sector to take advantage of opportunities for industrial growth. Most of the new companies are family owned, with a poorly defined corporate structure and weak governance. But they flourish because competition is limited. The sudden increases in wealth lead to the emergence of a nouveau riche, whose ostentatious consumption makes the prevailing poverty of the traditional society all the more evident. The new economic elite discovers that restriction of competition and corruption are highly effective strategies for building wealth. These practices undermine the development of sound choice-based institutions.

At this point, the transition can go either way. If government provides an adequate basis for market-led growth, the country moves into the middle years of the transition. Rapid growth conceals underlying structural weaknesses, but it offers sufficient job creation and expansion of basic services to keep workers and the emerging middle class on board. Corruption and anticompetitive restraints remain prominent at this stage, but are easily overlooked in the go-go atmosphere.

If, however, government policies inhibit market-led growth, the emerging private sector may become increasingly inward looking. Instead of driving growth, it comes to rely on collusion with the government to enlarge its share of a fixed pie. A narrow elite achieves

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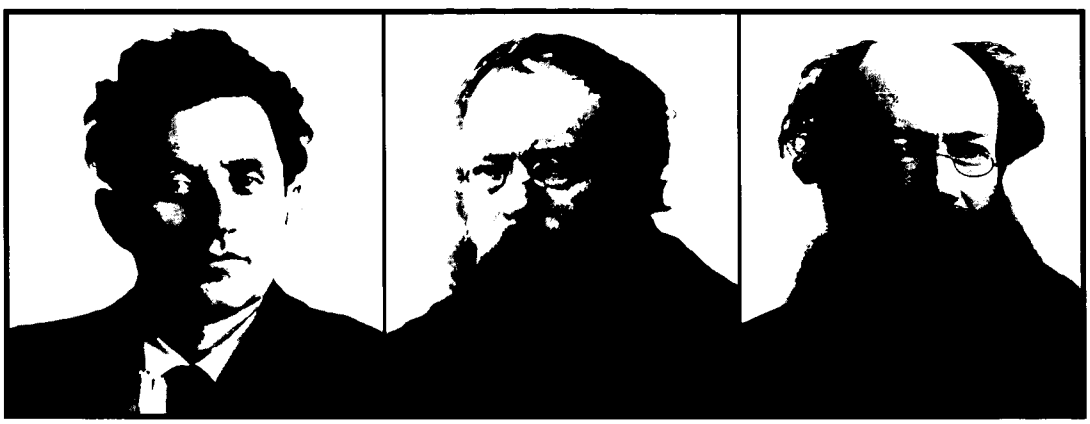
significant wealth, but the trickle-down is just that – a trickle. In an increasingly urbanized setting, the absence of services leads to Dickensian living conditions. But hardships are not balanced by rising incomes.

The contrast between the new rich and everybody else leads to discontent and alienation, particularly among educated urban youth. Denied both economic opportunity and legitimate channels to express their grievances, this group is vulnerable to arguments that the current system is irredeemable.

A number of countries in the early phase have fallen into this trap. They started down the path to industrialization along with the rest of the New Second World in the 1970s. But, like Russia and Spain in the early 20th century, their transitions stalled.

From Egypt, Nigeria and Pakistan to Kenya, Saudi Arabia and Iraq, the industrialization process started but never progressed into the sustained growth of the middle period. In each of these countries, the choice-based systems required to make the transition have been blocked by powerful command-based systems. These systems have achieved at best the spurious simulacrum of growth typical of command-based systems in the early transition phase, but have choked off sustainable, private sector-based growth.

History warns that the stalled transition should not be ignored. In all of the countries launched into the agrarian-industrial transformation path during the first transition wave (roughly 1850 to 1950), powerful stresses gave rise to violent, utopian resistance movements. Among these were the bomb-throwing anarchists who were the terrorists of their era.



Terrorists of yore: Gregory Zinoviev, Pierre Joseph Proudhon, Piotr Kropotkin

Most of the democracies were able to master the transition, moving forward quickly enough to spread prosperity and overcome the backlash. But the countries that failed to move forward suffered gravely. Russia's stalled transition led directly to the Bolshevik Revolution and to generations of cold war devastation. Spain's failure channeled opposition into anarchism, fueling a civil war and decades of fascist repression.

September 11 signaled that the phenomenon of the anarchist backlash has returned. The origins of this new terror have been dangerously misread. Neither Afghan poverty nor Islam is the problem. Afghanistan's weak state and rugged terrain simply make it the perfect

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cave of convenience for a movement whose origins lie in the stalled transitions of Egypt, Saudi Arabia and Pakistan.

September 11 was not the work of impoverished peasants, but of a new generation of anarchists in Islamic clothing. The recruiting ground is not the third world countryside, but cities where alienated young men are caught in stalled transitions. As in the previous century, bomb-throwing anarchists are led by charismatic, educated men drawn from largely middle- and upper-class backgrounds. Their forebears, men like Proudhon, Bakunin and Kropotkin, derived their inspiration from a distorted reading of Rousseau. The new anarchists have drawn on a perverted reading of the Koran.

Like its 19th century analogue, the messianic anarchists' message can be powerfully appealing: utopia can be reached by the violent overthrow of a corrupt system and the restoration of the natural order that capitalism displaced. This ideology attracts those who feel trapped on the wrong side of the window, looking at prosperity they cannot reach and that rewards corruption and immorality. Today's Islamic anarchists will not be defeated quickly or easily. Military action, while necessary to achieve security, cannot do the job so long as the conditions that drive young men to embrace terrorism persist.

Before exploring ways to deal with these dangers, we digress briefly to the New Second World's second danger point: the repeated economic crises of the advanced New Second World nations wrestling with complex institutional changes. As dangerous as stalling out in the early phase can be, the crises of the advanced stage can be even worse.

Mikail Bakunin, Gavrilo Princip, Fawzi Bey Al-Qawkchi

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CRISES OF THE ADVANCED NEW SECOND WORLD: FROM GERMANY TO ARGENTINA

As a country approaches the end of the middle phase, the future appears rosy indeed. Sustained industrial growth, having continued for a decade or more, has brought rapid and widespread rises in income. Poverty has fallen dramatically (although income inequality may have worsened), and a middle class has emerged.

However, from Mexico to Brazil to Thailand to Indonesia to Russia to Argentina to Turkey, this happy scenario has given way to crises in the countries that seemed to be doing the best. By calling attention to the

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need to shore up the service sector, late New Second World crises can be a healthy phenomenon – if extremely unpleasant to those caught up in them. But when governments do not respond appropriately, the transition can fail at this critical stage. Just as policy failures in the early phase lead to a stalled transition, failure to navigate cycles of crisis can push an advanced New Second World country into collapse.

A small but critical group of advanced New Second World countries – Argentina, Indonesia, Turkey and Venezuela – now seem close to this precipice. Although real reforms have been made in each, they have proven unable to halt the downward slide. None will fall back to third world status. However, if they do not pull out of this slump they are in danger of sliding into the dark limbo first plumbed by Weimar Germany. In Germany's case, and in Japan, Italy and Spain, this collapse led directly to fascism and war.

Argentina and Turkey both face this danger. Yet, we are scarcely lifting a hand to pull them back from the abyss. Not every country that reaches the late stage of transition will become another Weimar, of course, but even those that are merely struggling with this transition deserve more attention.

FORMULATING A RESPONSE TO TRANSITION CRISES

New Second World transition crises are development challenges to be sure, but a foreign aid strategy fashioned for the cold war does not constitute an adequate response. A clear-eyed assessment cannot fail to conclude that we must move aggressively to craft new tools suited to the distinct requirements of the early, middle and advanced stages.

Many of the countries at risk – Egypt, Saudi Arabia and Pakistan, for example – are long-term allies where U.S. military action to change regimes is out of the question. Since United States security requires that we cease to tolerate policies that block the transition, we must find diplomatic means to foster the changes. In this context, foreign assistance emerges as one of the few tools on hand.

What is needed is not an increase in aid, which seems a stretch politically in any case. We need a redirection of aid's objectives to focus on the policy changes and institution-building needed to navigate the New Second World's dangerous early and advanced phases. Where aid managers have been reluctant to engage allies in tough dialogue on policies for growth, they must become forceful and must receive strong, proactive support from upper policy levels. Where Congressional leaders have used aid to advance parochial agendas, they must restore the focus on growth. Where resource-rich and middle-income countries have been excluded from assistance, we must develop alternative approaches that support their difficult transitions.

This activist approach would open us to charges of unwarranted interference in the affairs of sovereign nations, but we cannot accept this view. Putting the lid on this evil brew is a matter of self-defense, every bit as vital to our security as bombing the caves in Tora Bora. The next stage of this battle cannot be won in Afghanistan, but must focus on the much greater dangers posed by the educated, unemployed young men in the coffee shops of Cairo, Karachi and Jakarta.

Rather than merely disrupting terrorism, we must drive reform in these stalled transition countries. Only job-creating growth – and a U.S. commitment to achieving it – can stop the downward spiral leading to anarchism. Public diplomacy cannot overcome terrorism driven by real grievances – especially grievances founded on perceptions of

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United States indifference, or worse.

The second transition crisis demands an equally aggressive but wholly different response. Advanced developing countries, including Brazil, Indonesia, Turkey and Thailand, are already important allies and valued economic partners. They are democracies and, except in crisis, much more stable than countries stuck in the early phase. Despite these strengths, they need our help in building institutions for sustainable prosperity. If we do not help, we forfeit global leadership and send precisely the wrong signal to the endangered leaders of countries in the early transition phase.

Standing on the doorstep of the first world, the advanced New Second World countries can be valuable allies in addressing the stalled transition cases around them. We can realize this potential, however, only if we make them full partners in building reform in the early New Second World and third world nations. Allies like Turkey, Malaysia and South Korea have a key role to play in getting

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the stalled transitions of the Middle East and Asia back on track. Their role is not to provide financial resources, but to complement the aid effort as investors, buyers and advisers to key Muslim countries from Morocco to Pakistan to Indonesia.

To use their strengths, however, we must also become partners in addressing the advanced New Second World countries' weaknesses. Too often, we treat the leaders of struggling middle-income countries as though they were recalcitrant students in the IMF's classroom, rather than democracies striving to implement difficult reforms. We are right to hold them to a high standard, but we should judge their performance by the modest standard of our own history.

When we faced these tasks at the turn of the previous century, we were scarcely more democratic than Turkey or Mexico is today. The United States of Jim Crow, smoke-filled rooms, and half-baked bank reform would win few IMF kudos today.

RETHINKING COOPERATION WITH THE NEW SECOND WORLD

Can the United States foreign policy structure that served in the Cold War meet the very different needs arising from our increasingly important relationships with the New Second World? Yes, if the basic machinery is retooled to meet the new needs. Foreign assistance, in particular, must be restructured to overcome three barriers to its effectiveness:

1. Most of the nations stalled in the early phase receive foreign aid, but this aid is directed primarily to feel-good purposes and is rarely backed by high-level pressure for institutional reforms.
2. A critical group of resource-rich countries also face stalled early transitions. But because they do not need resource transfers, they are cut off from badly needed technical assistance and institution-building support.
3. The advanced New Second World countries have been allowed to fall through the cracks, with no mechanism in place to provide technical assistance or reform support.

The tools are in place to help the early-phase transition countries, but are not effectively aimed. In the second and third groups, our embassies have neither the programs nor the expertise to help in areas like shaping financial institutions or designing environmental regulation.

Money is not the answer. In any case, a resumption of traditional aid would not be welcomed by the advanced New Second World and resource-rich nations in earlier phases. But the most compelling reason to reject the current foreign aid model is that the U.S. is much more than a disinterested adviser in their transition. Foreign aid policy has largely been conducted in isolation from the private sector, often focusing on sectors or issues of little interest to business. This model does not fit the New Second World.

Efforts to advance growth require the active involvement of U.S. business as a partner to government, rather than as a substitute. A collaborative model, drawing on the approaches used by our European and Japanese allies, is needed if we are to mobilize the necessary expertise and protect our own interests. For the advanced transition countries, we need a new structure in which government, business, nonprofit institutions and academia play active roles in mobilizing resources, delivering assistance or both.

Foreign aid programs are beginning to seek partnerships with the private sector and to engage stalled transition governments more forcefully, but there is still a long way to go on both counts. Initiatives such as the U.S. Agency for International Development's Glo-

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bal Development Alliance and the proposed interagency Millennium Fund demonstrate that the Bush Administration is seeking new models for engagement.

Both of these experiments are in their early days, but the prognosis is not encouraging. The Global Development Alliance, which will finance partnerships linking the Agency for International Development, foundations and private companies in pursuit of shared development objectives, is a sound concept. But the program has been too modest in scope to achieve real change. The Millennium Fund will direct government-to-government aid to reward good performers among the developing countries – particularly low-income countries that adopt a strong market-oriented stance – but will do little to support reform in middle-income countries. Moreover, neither of these experiments will reach the advanced or resource-rich transition countries, because only countries that receive bilateral aid can participate in them.

The Bush Administration's aggressive public diplomacy programs are an attempt to fill this gap. But as long as this initiative focuses on expounding our position rather than on dealing with the transition countries' problems, it will fall short. At the embassy level, professionals have long recognized the value of supporting reform in the advanced transition countries and pressed into service the very limited public-diplomacy tools available to answer transition leaders' requests for help.

But public diplomacy programs are not designed to support structural reform. They focus on limited training for individuals, not on strengthening core governance institutions like central banks. Present rules bar programs aimed at technical areas, such as telecommunications regulation or water system investment – precisely the kinds of areas that need to be addressed.

Boldness is especially needed to deal with the stalled early-transition governments, which have resisted reform for decades. The danger that their continued intransigence poses requires that the United States adopt an interventionist approach, which would include the following:

When we faced these tasks at the turn of the previous century, we were scarcely more democratic than Turkey or Mexico is today.

1. Close coordination across the full spectrum of United States foreign and economic policy institutions. Coordination must also reach the trade agencies (Commerce and the U.S. Trade Representative), Treasury (for coordination with the multilateral banks and for financial sector reform) and the military. The role of Commerce, the Trade Representative and the military will be particularly important in the resource-rich nations, where their own business and military leaders play a central role in policymaking.

2. Strong dialogues on democracy and economic liberalization. These dialogues may sometimes best be carried out behind closed doors, but every opportunity for open dialogue must also be pursued to send a message of support to indigenous democratic forces.

3. Definition of a timetable and promotion of initial steps toward market opening and political choice. These may involve local elections, the broadening of permissible party

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registrations, a crackdown on corruption or an easing of restrictions on public speech.

4. Support with practical assistance channeled through both public and private institutions. The U.S. Treasury and American banks, for example, offer complementary resources to support bank reform.

Early-stage transition governments will not welcome even these modest steps. We are in a new situation, however, in which the threat to U.S. security from messianic anarchism demands that we engage them on governance issues. If we can contemplate invading Iraq, we can open a dialogue on democracy with the Persian Gulf states.

Such a heavy-handed approach would be precisely the wrong tack to take with the advanced New Second World countries, however. Unlike the majority of the early-transition countries, the advanced New Second World countries are largely democracies whose governments understand the challenges before them. They are well aware, for example, that their financial regulation is weak, and their technocrats know the remedies available. Just as in our own country, however, understanding the problems does not lead automatically to an ability to tackle them successfully.

Most New Second World governments would welcome technical assistance from the United States parallel to that currently received from Europe, Australia, Canada and Japan. Our allies and competitors in Western Europe and Japan have not terminated development cooperation with the advanced transition countries as they contemplated complex reforms, but have programmed modest levels of assistance to integrate support to their business sector with technical cooperation. Our failure to offer practical support to advanced transition countries often paints the United States as the global nag rather than a leader.

By failing to assist the advanced New Second World, we are also sending the wrong message to poorer countries. When the Andean nations look at Argentina, or when Egypt looks at Turkey, they see countries that have made Herculean efforts to launch their economies, but have crashed and burned. And they see a United States that is doing very little to help them back up.

A more open and collaborative post-foreign-aid approach will be needed to engage with advanced New Second World country governments, their business sectors and civil society. Based on the Kenan Institute's experience as a technical adviser in Thailand, we believe that a highly effective approach could be developed with a very small commitment of resources. Such an approach would allow advanced-transition governments to build binational public-private programs for reform as a counterpart to U.S. trade and security programs.

LAST WORDS

An effective U.S. strategy must respond to the New Second World's special needs, recognizing that they are neither third world clients nor first world colleagues. To meet the needs of nations stuck in the early phase, our policies must replace tolerance of governments that block choice – and therefore economic growth – with an insistence on progress toward choice and away from command. With the advanced transition nations, our relationship must be built on partnership and mutual benefit, on helping them to manage the challenges of modernization.

The alternative – a global glass ceiling that prevents sustained advancement through the transition phases of the New Second World – is a recipe for disaster.

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Does Education Matter?

BY ALISON WOLF

If the Milken Institute stands for anything, it's the value of education. Why, then, are we excerpting part of a book called *Does Education Matter?*, which hasn't even been published on the western side of the Atlantic? ¶ Because the author, Alison Wolf of the University of London's Institute of Education, is a marvelous provocateur who forces us to defend some very basic assumptions about education and economic growth. She is not questioning the overall importance of education to a civilized society, but is asking some very tough questions about how much education (and what sort) is enough. ¶ David Card, a distinguished economist at the University of California (Berkeley) and an expert on human capital, offers a rebuttal, which follows the excerpt. If you have views on the matter, too, we'd be delighted to hear from you – and we may even print your two cents' worth.

— *Peter Passell*

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For decades, politicians have been obsessed by and with education. They are convinced that it is in a uniquely parlous state – and that this matters as never before. This obsession rests on the belief that the world economy has changed. Lip service may still be paid to learning for personal enrichment and development, but the emphasis is unremittingly on what education can do for the economy.

But is education truly the elixir of economic growth? Does it deserve ever-greater government expenditure because it can deliver ever-increasing prosperity?

The more educated do indeed tend to earn more, but there are good reasons to question whether this is because education made them skilled. We cannot conclude that if everyone had the same education as the top earners, everyone would have the same incomes. And the more we expand and lengthen education, the less reason we have to claim this.

It is true that rich, developed countries tend to have high levels of education. But

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again, the link between national wealth and education spending is less straightforward than it seems. You can't conclude that more education, at any level, automatically spills over into benefits for society at large. Even the idea that education and success will be more closely linked than ever in the globalized 21st century is less obvious the harder you look. Politicians may think it is clear that everyone's work will soon depend on their knowledge capital in a way that is quite different from the past. But it is just as likely that we need a workforce with basic skills as it is that we need more college graduates.

IT'S THE INCOME, STUPID

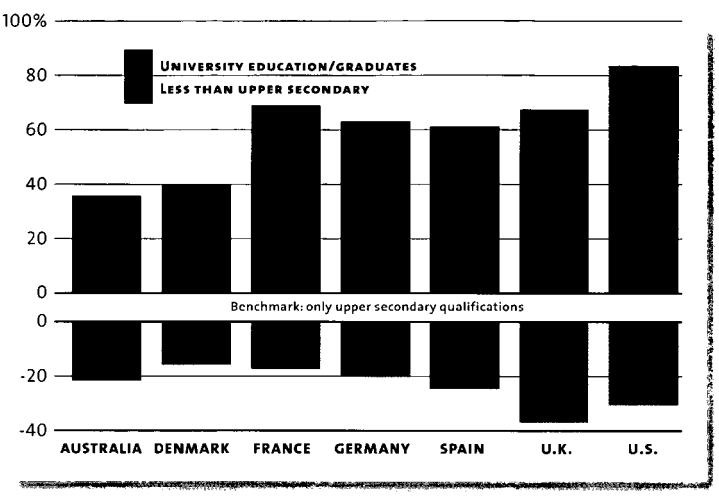
Whether or not education is economically good for a country, the past half-century teaches that it is good for the wallets of the educated. The more education you acquire, the higher your income is likely to be and the less likely you are to experience unemployment.

Among British men born in the 1950s, a higher degree meant that, after 20 years in the labor force, you would be earning on average almost twice as much as someone who had left school with no formal qualifications. For women, the picture was the same. Not only did they benefit hugely from university degrees. Higher vocational qualifications (typically nursing or higher level administrative/secretarial diplomas) gave them a greater advantage vis-à-vis unqualified women than was the case for the men.

This looks like a pretty good advertisement for education, and there isn't anything particularly British about it. The same pattern holds for developed countries in Europe, North America and the Pacific Rim. While the gap between the less and the more educated varies, the basic pattern is exactly the same. Those who leave school without a high school diploma, earn on average about a quarter less than high school grads, while those with some university education earn an average of almost two-thirds more.

AVERAGE EARNINGS, 1997-98

RELATIVE TO WORKERS WITH UPPER SECONDARY QUALIFICATIONS (BUT NOTHING BEYOND)



Percentage difference between the average earnings of individuals aged 25-64 with (a) less than a completed upper secondary education, and (b) some university education, compared with those of workers with upper secondary qualifications (but nothing beyond).
SOURCE: OECD, 2000.

Higher earnings aren't the only benefit associated with education. The more educated you are, the more likely you are to enjoy stable, long-term employment. Here, we compare male and female university graduates with men and women who left school before completing upper secondary education – many of them with no formal academic qualifications. Unemployment for this latter group is calculated as a percentage of the rate for the university educated; for example, the figure for German men is over 300 percent –

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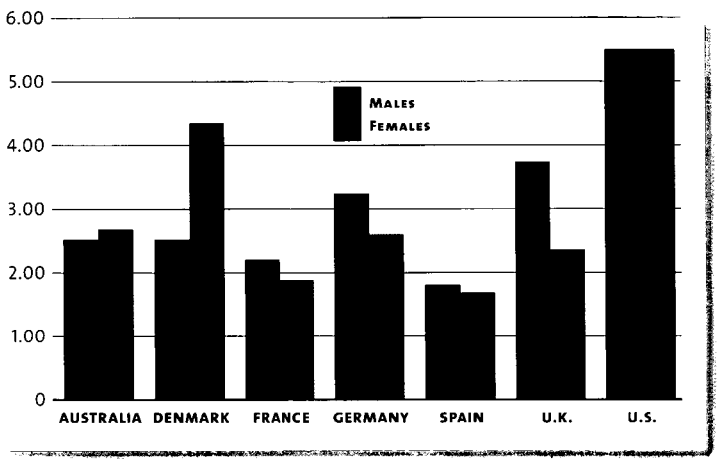
meaning that the unqualified are more than three times as likely to be out of work as are the university educated. In the U.S., the difference is more than fivefold.

The results vary far more between countries than do earnings. Nonetheless, the favored position of the educated is confirmed again and again. Compared to graduates, the least qualified have two, three or even five times as high a chance of being jobless. Not all graduates find the job of their dreams within a month of leaving university, and not all are equally in demand. But compared to their contemporaries, not only are their bank balances larger, their work lives are more pleasant and secure.

Moreover, there are signs that the personal benefits of education are getting more marked, not less. The U.K. (in common with the U.S.) saw big increases in wage inequalities over the past decade. Much of this takes place within groups; if you took all the workers of the same age, education and gender in 1980 and compared them with the parallel group in 2000, you would find that the latter had much more varied earnings, with a larger gap between the top and the bottom. But there are also widening differences between groups defined by their different educational backgrounds, suggesting that educational qualifications are increasingly important to people's chances in the job market.

RATIO OF UNEMPLOYMENT FOR HIGH SCHOOL DROPOUTS TO UNEMPLOYMENT FOR COLLEGE GRADUATES



SOURCE: OECD, 2000.

Trends in the U.S. attract particular attention, partly because of its huge economy, but also because of its relatively unregulated labor market. This makes it more plausible to interpret wage changes as a reflection of individual skills and productivity. (In most other countries, centralized wage bargaining, government controls and/or political values have a greater impact.)

There is also the belief that what happens in the U.S. today will spread to the rest of the world tomorrow. In that case, education will start to look like even more of a sure-fire bet. For, in the U.S., the wage differential between the more and the less educated is now less a gap than a gulf. In 1970, for example, high school dropouts earned two-thirds as much, on average, as college graduates. By 1993 the figure had fallen to well under half. Put another way, the gap between dropouts and those with a high school diploma was as large by 1993 as the one between dropouts and college graduates had been 20 years before.

These figures are averages. And, of course, there are individual differences in skill and ability that matter irrespective of education. Nonetheless, the success of Richard Branson (of Virgin Atlantic fame), the Spice Girls or, at

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the other extreme, the odd homeless graduate, does not change the general picture. Pick a highly educated and a poorly educated person at random and you can almost guarantee that the first will be earning more than the second.

So far, "get educated, get richer," seems like sound advice. This isn't quite the whole story though, because education isn't free. Tuition is the most obvious up-front cost; in many poorer countries it cuts in well before university level. Less obvious, but no less real, is the income you forgo by studying rather than working.

In developed countries this is rarely an issue until your mid-teens. Until then, school is compulsory: to 16 in most of Europe and the U.S., but even later in Belgium and Germany. For most 15 year olds, not to mention those aged nine or 12, the choice between school and work isn't real.

From age 16, however, it certainly is. Huge numbers of high school students now combine education with part-time work, although this falls far short of a full-time wage. But suppose someone who left with a high school degree earns 5 percent more full-time than someone who left school two years earlier. Is that really worth it? Two years is also 5 percent of a 40-year working life. Straight away this suggests that, over a lifetime, the high school graduate is financially pretty much where they would have been anyway. In the meantime, depending on your tastes, you could say that they have had either two years hard slog with no ready cash, or two years avoiding the boredom of work and enjoying long school holidays.

These costs of staying in school explain why it isn't enough simply to compare the average earnings of people with different education levels. We need to see what people get from more education after allowing for both direct expenses and income forgone. This is what economists mean by the net returns on education. Think of your education spending (including what you don't earn) as an investment. What percentage return do you get, and how does it compare with alternatives – for example, saving that amount of money in a bank account?

A lot of ink and effort has been expended on calculating such returns, with no great change in the general conclusion. Education, especially higher education for those who can get it, still comes out looking like a good deal. In Britain, a government committee estimated the rate of return on students' own investments at between 11 and 14 percent, adjusted for inflation. Other British studies suggest the returns are even higher. And research from America shows comparable results.

But how about governments? Should they take the higher incomes of the more educated as a signal that education breeds wealth (and so growth)? Most policymakers appear to believe precisely that. But in fact, you can't use the link between education and earnings to predict anything about future growth. The higher incomes of the more educated don't, in themselves, tell you anything, except that the educated are doing better than if national income were shared out equally. Before concluding that they "deserve" it because of the wealth they themselves generate, or that the whole country benefits because of their skills, we need a good deal more evidence.

PRIVATE INCOMES OR NATIONAL WEALTH?

People who look at the returns to education are at pains to distinguish between private returns – the benefits to individuals who receive the education – and "social returns," which take into account costs and benefits to society as a whole, not just those educated. To

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calculate the social return, people work out how much income is generated as a result of education, and what sort of return this offers on the *total* amount spent rather than on just the amount spent by the educated themselves.

These estimates of the social returns to education spending have almost invariably been large. Even though governments in industrialized countries are spending vast sums, the calculations yield high rates of return, indicating that the country gets back substantially more than it puts in. This is one reason why the growth-education link is such a deeply rooted part of received wisdom. Unfortunately, when we look at how these estimates are made, it becomes clear that we can't make a leap from the pay of the educated to collective economic success.

The problem is that the only real measure of people's productivity is their wages. What government economists do, therefore, is assume that wages reflect the contribution people make in their workplaces. In other words, the higher wages of the educated are interpreted as a reward for their greater productivity. So, if an average graduate is paid twice as much as an average dropout, this is taken to mean that one graduate can in effect do as much for the economy as two 16-year-old dropouts.

Social return calculations adjust for costs differently from the individual calculations discussed above, and so provide a different take on the yield to education. Governments cover the full costs of primary and secondary education, and also most of the costs of higher education; so there is an obvious difference between the net benefits to an individual, and those that his or her education brings society. As an individual you take into account what you pay, and what you might have earned if you hadn't been in school. The government, by contrast, takes into account all the costs of education. State spending swamps individual spending at the school and university levels. Even in the U.S., where university students traditionally pay tuition, less than a third of university income comes from tuition, and enters a private rate-of-return calculation.

So working out the social rate of return on education – i.e., what education spending actually does for economic growth – involves calculating the return that an individual's wages represent on the total educational spending or investment that preceded it.

Rates-of-return calculations sometimes also take account of the likelihood that those with the greatest natural ability also tend to be highly educated. This means that some of their wages reflect natural ability rather than education, and so can't be counted as a return on education spending. Economists guess how much this amounts to, and deflate the estimated returns accordingly. But they still rely on wages as a measure of productivity, so basically, the social returns to education will appear high if the highly educated are getting paid a lot more than their less educated fellow citizens.

Using this approach, we typically end up with figures that are considerably lower than those for individuals, but still pretty high. For example, the Dearing Inquiry in the U.K. estimated that, since the late 1960s, the social rate of return on investments in higher education have run about 7 to 9 percent.

In other words, education comes out looking like an excellent way of generating economic growth. Unfortunately, while using wages may be the best we can do when estimating people's economic productivity, as a basis for major policy decisions it is thin gruel. To see why, take everyone's favorite profession – the law.

The rebels in Shakespeare's *Henry VI* had a simple political program: "The first thing we

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do, let's kill all the lawyers." Few of us would go that far. But it is very hard to see lawyers' salaries, and their share of GDP, as somehow reflecting their contribution to economic growth. They have far more to do with the nature and volume of law and regulation in a society – most obviously in the U.S., which has at least six times as many lawyers per head as Japan.

so. Plenty of other developed country pairs offer comparable differences in relative rates of return.

Rate-of-return analyses are hugely seductive because of their apparent precision: "Society gets X percent from upper secondary education, Minister, but a hefty Y percent from more graduates." Such comparisons can and do influence policy, but their apparent

While using wages may be the best we can do when estimating people's economic productivity, as a basis for major policy decisions it is thin gruel.

A detailed rate-of-return analysis in the U.S. would suggest that the fastest way to boost growth would be to send everyone to law school. This is clearly ridiculous, but it is an exact parallel with what happens when we use calculations of social rates of return to defend increased education spending.

In reality, earnings reflect a great deal more than individual productivity. The amount paid to different groups and different individuals also depends heavily on the way a society is organized – how it runs services such as health and education, how much its public and civic cultures value equality, how professionals' fees are regulated. Look again at Denmark and the U.S. The U.S. has enjoyed a huge economic boom in recent years, but so, too, has Denmark. This tiny country has the highest proportion of its working-age population employed, the highest income per head in the EU, and a thoroughly high-tech industrial structure. Yet returns to education are, apparently, markedly lower than in the U.S.

Does this prove that education contributes less to the Danish economy than it does to the American? We would be most unwise to think

precision is spurious. A person's earnings are a highly imperfect measure of his productivity. The statistics we use in these calculations are themselves often far from accurate; and social returns are, to quote my colleague Gareth Williams, merely "private returns tweaked a bit."

Consequently, we cannot use rates of return to prove that more education spending must be a good idea. On the contrary: it is no more self-evident that since some education makes some of us richer, more would make more of us richer, than it is that "two aspirin are good" means "five aspirin are better."

To reach some firmer conclusions about education and growth, we need to go beyond the statistics and look at what the underlying processes might be. We know that modern societies couldn't be run by illiterates, or without lots of scientists and engineers. But can we tell whether educated people are paid more because of specific skills learned at school and others didn't? Or whether education spills over into economic development across the whole of society, with the educated doing us all a favor in the course of bettering

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themselves? Can we tell, finally, from current trends in the world economy whether more education now is really the priority that our politicians proclaim?

SORTING BY SKILL OR JUST SORTING?

The higher wages of the more educated may reflect education's contributions to growth and productivity. This is certainly the argument made when rates of return are used to justify yet more government spending. But incomes depend on a lot more than school-learned skills. Another factor is the overall level of industrial development in the society around us – which is why unskilled workers from the third world can be so much more productive if they make it to Europe or the U.S. Yet another important influence may be personality or basic ability, which have nothing directly to do with education.

Education today is a socially acceptable way of ranking people that most employers would find hard to do without.

Employers are certainly using education when they hire. But might they be using it as something more than a measure of skills? Might education serve, essentially, as a simple way of ranking, screening and selecting people in a mass society?

The simple answer to this last question is: "yes." Education today is a socially acceptable way of ranking people that most employers would find hard to do without. But if selecting by education is so widespread, it must also be delivering more or less what the selectors need. So why are they paying more to the educated? Is it because this guarantees them employees with particular skills, or because the more educated tend to be smarter and to work harder? Or is it just that hiring by credentials is convenient, legal and unlikely to lead to trouble?

This is, quite literally, the multibillion-dollar question for education policy. It is obvious that education is a good bet for individuals. However, the decision to pour vast sums into it rests on the belief that high wages are recognition of greater productivity, itself based on learned skills. Unfortunately, the question also turns out to be almost impossible to answer with any accuracy because a lot of things are going on at once.

Employers are generally on the lookout, other things being equal, for the most able and intelligent people they can find. How long you stay in education is itself very closely related to how well you do in school, so years of education are a good proxy for the sort of general intelligence that schools reward. Academic achievement fairly early on also determines what sort of courses you take. So the differences in earnings associated with different qualifications may say less about skills these courses teach than about the people who take them.

On top of that, years in education are also a reasonably good indicator of motivation, perseverance and organization – all of which top employers' wish lists. Of course, this isn't all that employers want, or that jobs demand. Nonetheless, if one single indicator of educational success, like a college degree or a high school diploma, wraps up a whole bundle of cognitive and personality measures, then, from an employer's point of view, it is a pretty good indicator. What is more, the evidence suggests that employers are right to see cognitive skills (along with motivation and self-

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discipline) as good predictors of productivity. Measures of general cognitive ability are quite strongly correlated, for example, with how quickly people learn skills and with their performance on the job – at least in situations where we can actually obtain some reasonably objective measures.

For many employers, education's usefulness as a signal of ability may be the salient consideration. However, that doesn't mean concrete skills learned through education are totally irrelevant. Someone who has very high cognitive abilities but is totally illiterate is not much use to most employers in a modern, developed economy, and certainly couldn't substitute for many of the graduates currently parlaying their education into high pay.

Suppose, though, that everyone left school for good at 15, or even 12. Suppose too, that, before leaving, everyone took some exams that provided a clear ranking of the population. How much less productive would the economy, and most of these people, be? Conversely, is all the money poured into education and training beyond that point really having a substantial effect on the sorts of skills people have, and their usefulness to employers?

Economists have devised a number of ways to assess whether returns are to "ability" or "skills." However all of them are open to serious criticism. A common approach looks at employed versus self-employed workers on the assumption that the self-employed don't need to signal their ability to employers; instead, their incomes (and returns to their education) reflect their human capital. But the employed and the self-employed are very different groups (notably in their taste for self-employment) so you are not comparing like with like. Nor is it clear that formal qualifications are as irrelevant as signals in the

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self-employed sector as this approach assumes. Comparisons of identical twins (to see how education differences affect the pay of genetically identical people) are also problematic because of the small and nonrandom nature of the samples that can be studied.

We are left with the conclusion that returns to education partly reflect its use to sort people, and serve both as a proxy for ability, and a recognition of concrete skills. This is

sensible enough – but not much help in actually planning an education system, let alone pinning down the best sort of education for growth. Can we say anything more about what sorts of skills seem to matter to employers, and how far they are the product of formal education?

WHICH SKILLS MATTER?

So far, this discussion has treated education as though all that mattered was how much you got. So 10 years is better than nine; some college education is better than just going to high school. But if the skills people acquire are important for growth, then this way of treating education looks rather odd. Do employers really reward you equally whichever courses or degree you took?

Perhaps they might if they were only using these qualifications as a general screen for ability. Conversely, if they don't, we may get some clues here about which skills learned in school, college and university are more closely linked to the requirements of the economy than others.

Earnings data show very marked differences in the salaries associated with different types of qualification. However, it is impossible to use these data as a source of information on skill needs because different qualifications have different status. If a degree pays better than a vocational diploma, this may be largely, or entirely, due to that same screening for ability we have just discussed; employers assume college graduates are brighter and keep the better paying jobs for them. Instead, we need to look inside a group with equivalent education – for example, those same university graduates for whom so many occupations are now reserved.

It turns out that the market does indeed distinguish between different sorts of university education and that there are major differences in the average earnings of graduates with different degree subjects. This is no doubt true partly because some people and some degrees are not oriented toward high-earning opportunities. Few of us conclude that being a religious leader must be a worthless, low-status occupation because it is badly paid. Again, some degrees lead to occupations where the financial reward is government- rather than market-controlled. Here, what people are paid says as much about politics as it does about productivity.

However, in other cases, one is looking at what people get paid in a fairly open market. And, here again, you find that the subject of a degree matters a great deal. English graduates are simply not paid as much, on average, as those with accountancy, economics, engineering or mathematics degrees.

This can partly be explained by differences

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in graduates' previous academic records – some subjects are harder to get into than others. That is only a part of the answer though. Even when you control for these factors, there are major differences in later earnings according to your type of degree. This strongly suggests that employers aren't solely occupied with putting people in rank-order. What this information doesn't do is translate into some sort of fail-safe policy of education for growth.

The table to the right summarizes private rates of return in Britain for different sorts of degrees, but looks, too, at the social rate of return. This is calculated in the conventional way, by adding in the costs borne by government. Science degrees and engineering degrees cost a lot more because they need a lot of equipment and more individual attention from staff. So while they pay better than arts degrees, once you add in the full cost of the degree (borne by the state), the social rate of return looks rather different. Engineers may have higher private rates of return (and average salaries), but the social rates of return look much lower for them than for graduates in the social sciences.

Does that mean that a government going for growth should ignore the salary evidence, mothball the science laboratories, and channel everyone into social science? Packing thousands of students into halls to hear economics or business professors lecture is certainly a very cheap way to generate credentials and increase graduate numbers. But a surefire way to growth?

The returns to different degree subjects underline how limited a guide to policy these seductive numbers can be, and how dangerous it is to use them to peddle educational spending as an elixir for growth. On the other hand, treated carefully, they can provide some indications of which concrete skills are important in the modern economy – and whether governments' assumptions and spending priorities make any real sense.

The best data for this purpose in the U.K. (and some of the best in the world) come from the National Child Development Study. This remarkable study tracks all the children in the U.K. born in one week of March 1958. Findings from it and a sister study (involving a cohort born in 1970) are a major source for understanding how education really affects people in 21st century Britain. Information is collected at regular intervals on participants' education, jobs, family experiences and health. In addition, as adults, they have been asked to complete independent literacy and numeracy tests – tests quite separate from anything required for schools or employers. The results were not known to anybody but the researchers. So again, they provide a measure that can be used to assay the effect of skills rather than formal education.

These study participants' experiences underscore the enormous importance of basic academic skills in modern societies. Poor literacy and numeracy – especially poor numeracy – have a devastating effect on people's chances for well-paid and stable employment. This is not just because people with poor skills tend to have few formal qualifications. Even after you control for these, the effects of low skill levels are major and evident.

EXTRA EARNINGS FOR GRADUATES

DEGREE	WAGE PREMIUM FOR GRADUATES (Men: 1984-86 and 1989-91)	SOCIAL RATES OF RETURN (Young men: 1986-89)
Social Sciences	20-25%	11-11.5%
Engineering	18-24%	5-6.5%
Science		4.5-5.5%
Arts	2-4%	—

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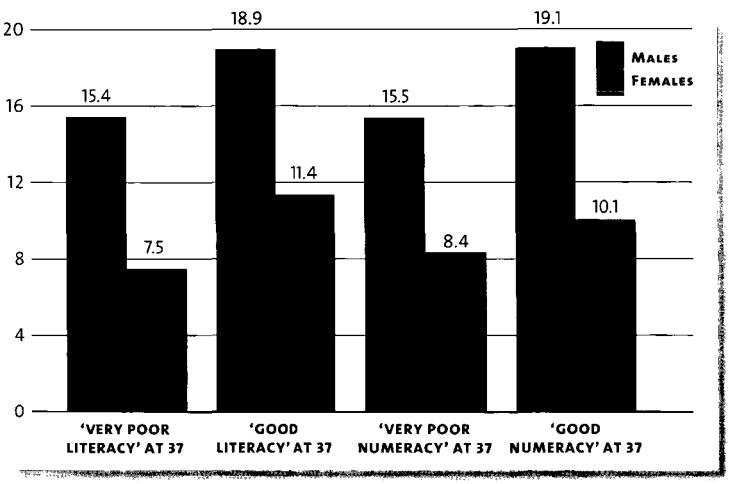
To compare like with like, the figure focuses only on those who left school at 16, and who therefore could, in principle, have been employed for equal lengths of time. These people can be classified by their performance on a set of literacy and numeracy tasks, which they were given at the age of 37. And as the figure shows, there were major differences between high and low scoring groups in their employment histories. The groups were also very different in terms of the likelihood that they would be unemployed at age 37, and in the types of employment they held.

AVERAGE YEARS IN FULL-TIME EMPLOYMENT
BETWEEN AGES 16 AND 37; LEAVING SCHOOL AT 16



SOURCE: J. Bynner & S. Parsons (2000); additional unpublished NCDS data.

Moreover, there were still large and significant differences after researchers controlled for formal qualifications obtained before leaving school at 16. This suggests that people's work success was related to their actual skills, not just to screening by qualifications. Further support for this idea comes from people's relative chances of being employed not just at age 37 but also at 21, 24 or 30. For very low scorers, and especially very low numeracy scorers, the gap widens dramatically over time. As young people, their relative chances of employment compared to the more skilled are nothing like as bad as they become later.

The National Child Development Study data also allow us to see whether particular school subjects are more important in the labor market. The answer generally seems to be "no." There is, however, one striking exception. Even after allowing for every other factor imaginable, people who did well in math earn substantially more – around 10 percent more – than those who did not.

The reason this finding is so interesting is that it applies across all occupations, however wages are fixed or determined. Of course, we can't be sure that people are actually more productive because of their math skills. But given that we are looking at the effects of a qualification that most employers and colleagues won't even know the individual possesses, it does seem very likely the case. Thus, for once, we have found strong evidence for economically valuable skills rewarded as such.

Evidence from the U.S. also suggests that what is important, and increasingly so, is the traditional core of the school curriculum. The evidence again comes from large longitudinal studies – this time of young Americans who were in their final year of high school in 1972 or in 1980. These young people were given language and math tests by the researchers, but the results were not known by their employers or by colleges they subsequently attended.

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This again makes it possible to look at whether skills, as measured on these tests, affect future earnings over and above the effects of formal qualifications or of test scores that are public knowledge. The answer is that they do. Moreover, the effects are higher for the 1980 than the 1972 group, and higher six years into employment than two years in – which means their effect is greater at the point when someone's substantive skills, rather than just bits of paper, will be more evident to employers. Moreover, it seems, again, to be math that matters most. The test results are likely, of course, to be proxies for more general ability. However, their increasing importance between the 1972 and the 1980 cohort cannot easily be explained away.

None of this strengthens the case for using rates of return to different formal qualifications as a guide to education policy. The arguments that politicians advance for the importance of more education at higher levels rest ultimately on the apparent value of advanced education compared to what is learned in schooling that ends at 16. Yet, in the context of a modern economy, this focus on returns to different qualifications risks devaluing core academic skills.

Almost everyone who masters the core skills properly now goes on to higher education. So the returns they get look as though they aren't payoffs to primary or even lower secondary education, but to later education levels and formal degree awards. However, we can't conclude from this that the skills that employers are actually using and looking for are indeed the ones gained late in one education. The most valuable could well have been acquired much earlier, by age 14, 16 or 18 – and we have seen strong suggestions that this may indeed be the case.

Second, the importance of core academic skills provides support for emphasis on literacy and numeracy, but precious little for vocational education and training. The evidence on skills suggests that employers in the brave new knowledge economy are after just those traditional academic skills that schools have always tried to promote. The ability to read and comprehend, to write fluently and correctly, and to do math appears more important than ever. It isn't obvious why this means pouring resources into more years of education rather than increasing quality in the places that already teach these skills.

Even after allowing for every other factor imaginable, people who did well in math earn substantially more – around 10 percent more – than those who did not.

Nonetheless, if the data on screening and skills are so inconclusive, perhaps we would do better to look at a wider picture. Advocates of greater educational spending argue not just that it increases the productivity of individuals, but that there are spillover effects that raise the whole country to higher levels of wealth. This seems plausible enough. The unskilled worker from the third world whose wages quadruple as he crosses a border illustrates how much our welfare depends on where we have the luck to be born. Can we,

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though, come to any clear conclusions about how education plays a key role in kickstarting or accelerating a country's growth as opposed to other candidates – good governance, open markets, tax incentives, investment and the like? Can we, in particular, find support for government policies to promote education?

ECONOMIC MIRACLES AND ASIAN TIGERS: WAS EDUCATION THE KEY?

If links between education and earnings within a country are less clear than most of us think, perhaps we would do better by comparing countries. It is, after all, international comparisons that have really fueled the U.K.'s education panic. In the 1970s and 1980s, Britain was preoccupied with its relative economic decline compared to other European countries and the Asian tigers. The concern: Britain was caught in a "low-skills equilibrium" because its relative failure to educate its workforce had left it ill-equipped to adapt to international competition.

The enthusiasm developed countries' politicians now show for education (and not just in the U.K.) echoes the experience of many developing countries in their first years of independence. It is self-evident that prosperous nations are also highly educated ones. But can you conclude that the education caused the prosperity, and that spending on schools spills over into general well-being?

The short answer is "no." The experience of the developing world actually makes it all too clear that education cannot guarantee growth. It is certainly not enough on its own; the more interesting question is whether it is even relevant.

A comparison of developing countries in the decades since World War II suggests a rather weak link between education and economic growth. In 1980, Egypt was the 47th

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poorest country in the world with GNP per capita of $580. Fifteen years later it was the 48th poorest, averaging growth of less than 2 percent a year in the meantime. Yet in the period since 1970, primary school participation had risen to well over 90 percent and secondary school participation from 32 percent to 75 percent, while between 1970 and 1980 university participation rose from 9 percent to 17 percent.

Compare this with South Korea, and almost the only common feature to be found is educational expansion. South Korea had a growth in per capita income of over 7 percent a year from the 1960s to the 1998 crash. In that period it also took primary education from near-universal to universal, and secondary participation from one-quarter to everyone. And while in 1979 it had a smaller proportion in university than Egypt, by 1993 this proportion was much higher. So you grow economically and expand your education system enormously. Or, like Egypt, fail dismally to achieve economic success, in spite of huge educational expansion.

A number of recent World Bank analyses suggest that, across the world's developing economies, there exists a negative relationship between education levels and growth. In other words, the countries that have done most to increase the education levels of their population have, on average, grown less fast than those that have devoted fewer resources to education.

This finding seems profoundly anti-intuitive. However, when we look more closely at some of these economies, it becomes clear that, while spending on education isn't really reducing economic growth, educating people also doesn't, in itself, offer them much to bolster economic success. Yet the belief that it did led many developing countries to spend a great deal of money without creating successful economies.

Egypt made a commitment to give graduates first call on jobs in the public sector. It very quickly found itself with a vast underemployed army of civil servants, and a huge queue of students aiming at comparable sinecures for themselves. Sri Lanka and much of sub-Saharan Africa exhibit similar characteristics. In Sri Lanka, for example, the post-colonial governments inherited and continued a system in which school exams were used to ration government jobs. Mounting pressure on these jobs, from educated teenagers in an economically stagnant society, was the trigger for two major youth insurrections and loss of life, in 1971 and again in 1988-89.

In situations like these, rates-of-return simply reflect back social inequalities. Compare the salaries of those who actually make it into government and other top jobs with the wages of the population at large, and the figures will suggest that what is needed is yet more university or academic high school graduates. You could easily conclude that education in Egypt was contributing splendidly to growth, since the huge graduate-filled bureaucracy is paid a lot more than the vast majority of less educated Egyptians.

Economies that embraced central planning were also likely to believe in the importance of rapid educational expansion, and to generate large numbers of expensively educated bureaucrats who had gone through both upper-secondary and university education – along with low economic growth. In post-Thatcher New Labour Britain, a belief in central planning now seems like ancient history. But in the early 1970s, an organization like UNESCO was behaving in a completely mainstream and uncontroversial manner when it identified its priority as establishing "a close relationship between educational planning … and national overall plans for

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economic and social development." This helps to explain why, in comparisons of developing countries, education spending and growth in human capital can end up looking as though they are negatively related.

The obvious riposte is that neither developing countries nor the command economies of the post-World War II period have much relevance to education's role in the most successful industrial countries. As a senior British Government bureaucrat might point out, no members of the OECD "rich men's club," whether longstanding (like the U.K.) or new (like Korea) has practiced manpower planning for many a decade. And what possible lessons can the heavily agricultural, low productivity economies of Egypt or Sri Lanka have for the U.K. government's plans to foster economic growth?

The experience of the developing world actually makes it all too clear that education cannot guarantee growth.

But do comparisons of developed countries, older and newer, show anything different? More specifically, once you reach a certain point, does the effect of education spending change so that it really does become the engine of growth? Again, not obviously so. Reviews of the industrialized world do not produce anything quite so startling as an apparent fall in the growth rate associated with high education spending. But they don't generate evidence of positive effects either.

Korea is the favorite example of those who want to make a case for both educational spending and active government involvement in education. They point out how Korea ran a massive national literacy campaign in the immediate postwar period, and then expanded secondary schooling with a strong emphasis on equalizing school quality across the country. How it expanded vocational high schools and technical universities, even though this cut against the direction of student demand. And how there has been no problem with skill shortages during a remarkable 50-year period of growth.

All true, and very impressive. It is hard to believe that this education policy didn't help Korea's success. But did it cause it? Was it even a critical factor? If you want to argue that, you also have to find evidence that developed countries with poorer education policy and lower spending levels suffered.

In fact, among the most successful economies, there is no clear link between growth and spending on education – let alone between growth and central government involvement in education planning. Surges in growth don't follow consistently from surges in educational achievement; nor is the reverse true.

This holds even for the tiger economies. Hong Kong had nothing like the central planning of education evident in Singapore or Korea, but its growth rate has been comparable. Switzerland was the richest developed country in both 1980 and 1993 – and also one with a history of relatively low public expenditure. The proportion of its young people in university or other higher education is way below the average for the developed world. Compared with the average for the OECD countries, Swiss university enrollment rates have for much of the past quarter century hovered at around a third of the average for the OECD, and some OECD countries registered rates five or six times higher.

In the late 1990s there were headlines galore for England and Scotland's relatively

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poor showing in the Third International Maths and Science Study – or rather plenty for the maths results, and far fewer for science, where scores were near the top. This study, like a number of previous ones, involved giving the same tests (in translation) to large samples of primary-school age children at the same points in their school careers. A considerable number of developed countries participated: Singapore, Korea, Japan and Hong Kong were all at the top in math, while England and Scotland came just below the middle. But for the group as a whole, the correlation between math scores and GNP per capita is so weak as to be insignificant.

The country whose performance really deserves more attention in this context than it usually receives is the U.S., which lurks consistently below England in these international tables. Most European commentators register American education only to condemn it. In this they echo Americans themselves, who have been worried enough about their children's poor performance to publish official reports accusing themselves of "unthinking, unilateral educational disarmament," and who bemoan the "dumbing down" of American culture and the low prestige attached to academic success by teenagers.

Critics have therefore viewed American education as unproductive and inefficient. Indeed, one analysis arguing for the importance of education and educational planning by governments, perceived America as caught in something akin to a low-skills equilibrium – the state of which the U.K. stands accused. Such an equilibrium implies that there is a self-reinforcing situation in which minimally skilled dropouts are delivered into a labor market, which must therefore concentrate on low-skill, low-value products.

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The timing was unfortunate, for the analysis appeared in 1996 when the U.S. boom of the 1990s was already underway. Suppose American education really is so poor, and education really is so critical to growth. One may well wonder why this country not only enjoyed record-breaking growth in both output and employment, but was also the main source of innovation and product development throughout the last decades of the 20th century. Do we conclude that American education was getting it right all along and should be copied? Or that the links are less obvious and less direct than we once thought?

I would argue that there is no more guarantee in developed than in undeveloped countries that skills will necessarily be used productively, in the sense of fostering growth. In discussing what set countries on the road to prosperity in the past, Douglass North provided a vivid example of how time and circumstance may steer human capital into productive or unproductive channels. He points out that, "to be a successful pirate one needs to know a great deal about naval warfare, the trade routes of commercial shipping; the armament, rigging and crew size of potential victims, and the market for booty."

In other words, a successful pirate was a highly skilled human being. Moreover, in much of the world, through much of history, piracy was one of the few ways in which able young men from poor families could hope to make large sums of money. But pirates hardly generated economic growth or enriched the society around them. Indeed, the more skilled, the less so.

Modern developed countries give their trained and educated people strong incentives to go into more obviously productive, or socially worthwhile, careers than piracy. They nonetheless vary enormously in how much they promote economic growth in other ways – and in how many people choose jobs that are "dead weight" in terms of growth. Lawyers and sheet-metal workers are both highly skilled (if somewhat less versatile than your top-rank pirate). But suppose the lawyers spend their time advising businesses how to circumvent laws. Or that sheet-metal workers, as happened in the 1980s in Britain, are poured out into a saturated marketplace by government training workshops with targets to meet, and a staff of highly experienced trainers whom industrial change had made redundant.

There is also another possibility. Maybe at the levels of income and education that the developed world has reached, we are seeing things back to front. Could it be growth causing education, and not education causing growth at all? Hong Kong children, if this scenario is right, may be pouring into higher education, and outperforming the English at math, *after* the meteoric growth rate of their economy – indeed, because of it. They are

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doing so in order to compete for jobs in an economy that, as the number of professional jobs grows, uses credentials more and more for hiring. And their prosperous parents can now afford long schooling – indeed encourage it – pushing them to compete academically, and so get into the best schools.

Economists Mark Bils of the University of Rochester and Peter Klenow of the Federal Reserve Bank of Minneapolis offer a test of this idea. The basic argument of the "education leads to growth" school is that education increases productivity, and this is why the educated have higher wages. However, it is also the case that, as workers become more experienced and build up time on the job, they tend to earn more. This is because of the skills they have gained while in employment – an "experience premium."

In most countries, over the past few decades the average duration of education for young workers in any given occupation has increased markedly compared to their older workmates. If all this additional education has really increased their productivity, both immediately (since they have less to learn when they start work) and in the longer-term (because they learn faster and more thoroughly), wages should reflect this. Over time, we should find that the experience premium declines. Highly educated young workers should get paid more on entry than the previous generation, but less of an experience premium because they have less to learn and learn it faster. And those countries with the most rapidly narrowing premiums should be the fastest growing, as they benefit from educated young workers.

These patterns can't be found; the breadth or narrowness of the experience bonus in workers' wages seems to bear no relationship to growth rates. If high-quality schooling is making any difference to the relative economic performance of countries, it is doing so in a very undramatic fashion since its effects appear to be swamped by other factors.

What Bils and Klenow do show, however, is that growth generates education whether or not education generates growth. While this reflects individual self-interest clearly, it is not at all obvious that every extra bit of education is benefiting the economy, or is the best thing on which to spend public money.

If high quality schooling is making any difference to the relative economic performance of countries, it is doing so in a very undramatic fashion

This evidence pours further cold water on any simple equating of education spending with national economic success. Should we go even further, though? Should we argue that education is actually irrelevant to growth?

The answer must be no, for all the obvious reasons that fuel our education panic in the first place. Modern economies do require educated people, and the latter command a premium in the marketplace in part because of their skills – not just because education serves as a sorting mechanism. While Switzerland may be educating fewer people for less time than France or Japan, it is still spending a lot, and supporting highly skilled research and development teams, in both private industry and in universities. Equally, in a modern society, illiteracy brings misery to people, erecting barriers in front of them and their children.

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So it would be bizarre to see our education systems as just a collection of white elephants. But, then, no one is seriously advocating closing down all publicly funded education, or even cutting 25 percent from its budget.

Plenty of people are advocating major increases in spending – and doing so not because people enjoy education, not because of its contribution to culture and learning, but because it leads to growth. Just what evidence does the late 20th century offer that suggests education policy should take pride of place in a government's strategy for growth, or that further public spending on education is the way to deliver productivity gains?

GLOBALIZATION AND A NEW DAWN?

To these skeptical arguments there is one obvious riposte: everything is different now. All this looking back at the experiences of people born in the 1960s and before is beside the point. We are now heading for a 21st century economy in which, to quote Tony Blair, "Brainpower, skills and flexibility – not cheap manual labor – are the key to competitiveness and productivity." What is relevant is surely not evidence from the past, but the emergence of what Blair calls a new "learning society," a new "knowledge economy," in which only education can deliver growth.

This view has been extremely influential and very widespread. The argument that a low-skills equilibrium is disastrous in a world of integrated markets and new technologies has, as we have seen, found precise echoes in the speeches of government leaders and the analyses of establishment think tanks. Kevin Roberts, the CEO of Saatchi & Saatchi, announces "Western economies [have] moved from manufacturing goods to manufacturing ideas." Ideas are why government enthusiasm for education has taken the particular forms it has – an enthusiasm for more and more higher education graduates.

And yet, does current conventional wisdom really follow? It would be silly to deny the importance of universities as generators of pure ideas, of applications and patents, and

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of practical industrial consultancy. But though we may know that our economies need universities, does that mean they need more of them, or even as many as we have? We know many jobs are highly skilled and that well-educated, high-achieving employees tend to be more productive and quicker to learn on the job. Does that mean that the unskilled are in peril of losing their livelihoods in an emerging knowledge economy?

There are two ways to help answer these questions. The first is simply to look at the way the labor force has altered over the past few decades. This gives us some broad idea of whether we are currently under- or overeducated, and whether we are heading for huge shortages of the skilled and mass unemployment for those with no qualifications. The second is to look for evidence of bonanzas for those societies for whom "high-tech" related education is a public priority. Does pumping up your supply of graduates deliver 21st century style growth, even if it couldn't guarantee earlier variants of economic development?

THE OCCUPATIONAL STRUCTURE

On one point, the new economy enthusiasts are absolutely right. If we compare the British (or any other Western) labor force in 1900 and in 2000, it is obvious that there has been a huge change in the sorts of jobs that people do. In 1900 about 780,000 people were employed in the British coal mining industry. By the mid-1990s, the number was 18,000. At the same time, there has been a century-long growth in the proportion of jobs that count as "professional," "technical" or "managerial," and a decline in both skilled manual jobs and in unskilled jobs generally. Moreover, these trends are expected to continue. Projections for the next decade are for a growth of 30 percent in openings for professionals, and for continued, if less dramatic, growth of 8 percent in job openings for managers.

This does not mean that we are all becoming computer programmers or biotechnology entrepreneurs. The data make clear the decline in traditional manual jobs. Manufacturing jobs have declined particularly fast, as happened with agricultural ones before them. However, this is far from meaning that there are fewer jobs for the unskilled because the labor market is only demanding skilled labor. On the contrary: the percentage of jobs that fall into the "skilled crafts" categories has fallen steadily throughout the 1980s and 1990s, and is projected to decline yet more. Meanwhile, some occupations that require much less of a knowledge base are thriving. The single fastest growing job in the 1980s was "postman;" that of the 1990s looks like "care assistant" in nursing homes and hospitals – i.e., an essential, low-grade, low-paid and pretty thankless service job. While professional and managerial jobs have certainly exploded in numbers, the greatest shrinkage has been among the skilled and semiskilled manual jobs in the middle. Millions of openings still exist for people to do things like cleaning offices, packing boxes, staffing call centers or operating supermarket checkouts.

Modern economies do require educated people; and the latter command a premium in the marketplace in part because of their skills, not just because education serves as a sorting mechanism

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There are all sorts of reasons why more education might benefit people who end up doing jobs like this – but they are not the sort of hard-nosed education-for-growth reasons so beloved by contemporary politicians. It is difficult to construct a convincing argument that more degrees are needed so that people will be educated enough to stack shelves, swipe credit cards or operate cappuccino machines effectively. And it is important to remember just how many jobs like this do exist. To listen to the rhetoric, you would think that every semiskilled job was going to vanish tomorrow, if not this afternoon.

There are two particularly important (and interrelated) reasons why it is skilled manual jobs, and manufacturing jobs generally, that have declined. The first is the vast increases in productivity that have occurred in manufacturing industries over the past few decades, so that equal amounts of output can be produced with a small fraction of the old workforce. The second is that manufactured goods – unlike nannies or bus drivers – can be made abroad and imported. So countries with lower wages than ours can undercut our manufacturers, especially for products that only need semiskilled workers.

This could mean, on the one hand, that manufacturers in developed countries have moved to high-productivity methods, involving more machines and even fewer workers, even faster than they would in the absence of such overseas competition – and on the other hand, that companies that can't manage this, simply close. How far this has actually happened (and how far it is because of trade with lower-wage countries) is a subject of enormous debate.

However, whatever the absolute impact of trade on manufacturing jobs, the general picture is the same throughout the developed world. In the foreseeable future, manufacturing is very unlikely, to generate big increases in employment, and very likely to continue falling in size as a proportion of the workforce. The absolute numbers vary between countries: Germany, for example, has an economy that is much more manufacturing-based than those of the U.K. or France, so the absolute importance of manufacturing has stayed higher there. But the trend is consistent, and there are no other major changes on the horizon that would generate big increases in demand for skilled manual jobs.

The idea of "overeducation" is a slippery one on which a great deal of ink has been expended.

Governments seem on firmer ground with university expansion. These occupational changes certainly bear out the conventional wisdom that demand for highly educated people has grown; since 1961, the proportion of jobs classified as managerial, technical or professional has actually doubled. But even here, it is not obvious that the current passion for yet more graduates makes sense. On the contrary, it is much easier to argue that we have an overeducated work force.

The idea of "overeducation" is a slippery one on which a great deal of ink has been expended. The usual, fairly common sense definition takes people to be overeducated if they have more education than is required to do their jobs. This begs the question of whether the overeducated person is doing the job much better – or, alternatively, rather

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worse – than someone who has had less formal education. However, if some people have skills that they feel aren't being used by their jobs, or if others with the same skills and qualifications are employed elsewhere for much more pay, one can reasonably deduce that these people are not working up to their full productive capacity. In other words, the economy has more skills around than we apparently know how to use.

People who look at this issue in detail have almost unanimously concluded that in these senses of the term, Britain definitely overeducates. They point out that large numbers of jobs now demand levels of education that were not required in the past. Spiraling numbers with formal qualifications mean that employers can now insist on people with more education, and will also suspect that anyone without them isn't worth having. The result is that jobs that 20 years ago were done by people who had left school at 16 or 18 now only go those with degrees. Projected increases in graduate numbers seem bound to make this mismatch even more marked.

At the time of the 1991 U.K. Census, the numbers of people in professional, managerial and technical posts with degrees and other higher qualifications was still under half. This might suggest a considerable skill shortage, in spite of ever-rising entry requirements. But the phenomenon is age related – older managers came to work straight from school, the young via university. Moreover, the category itself is misleading, since it includes huge numbers of owner/managers of small shops, hotels and businesses. It is hard to argue that a degree is a prerequisite for running a successful fish-and-chip shop or motor-repair business – though, on current trends, more and more proprietors are likely to have them.

The overeducated may, of course, be more productive than their less educated predecessors in a given job. However, this is another of those things where you can choose to believe it or not. There is certainly no firm evidence to suggest that the overeducated are more productive; nor, conversely, that being better educated makes you less motivated or actually worse at your job. We can't use the overeducation figures to establish whether much current education is economically a waste of money. However, we equally can't get much support from occupational changes for the idea that we are currently undereducating for our new century's economy.

There is one final possibility to be considered. Earlier, we looked at the historic link between education spending and growth on an international basis, and found it far from self-evident. Perhaps, though, the 21st century is going to be different. Perhaps we will find that those countries that are economic powerhouses are also those that have educated their way into a "high-skills equilibrium."

A simple comparison of occupational trends doesn't show anything obvious of this

CHANGES IN THE OCCUPATIONAL STRUCTURE OF EMPLOYMENT

% OF TOTAL EMPLOYMENT, U.K.

OCCUPATION	1984	1990	1998
Managerial/professional/technical	29.1%	31.8%	36.6%
Clerical/secretarial	16.1	17.0	15.0
Craft and related	17.7	16.0	12.2
Sales and personal services	14.3	15.0	18.8
Manual operatives	11.6	10.6	9.4
Other	11.2	9.6	8.0

CHANGES IN THE OCCUPATIONAL STRUCTURE OF EMPLOYMENT

% OF CIVIL EMPLOYMENT BY SECTOR, U.K.

SECTOR	1950	1971	1998
Agriculture	5.5	3.1	1.7
Industry	48.9	43.8	26.6
Services	45.6	53.1	71.7

SOURCE: Robinson (1997) and Institute for Employment Research (2000).

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nature. The general direction is the same everywhere in the developed world – less manufacturing and more services – although countries differ in the absolute size of each sector and the speed of change. A more sophisticated analysis comes from endogenous growth theory. This literature examines whether, in the new economy, highly educated people don't just produce more themselves but create an environment in which everyone is more productive. This would mean that their education spills over to everyone's general benefit – that the whole is more than the sum of the parts.

If true, this is very good news indeed for education spending enthusiasts. Instead of muttering about students lolling around at taxpayers' and parental expense, we could see them as future benefactors of the nation; rather than seeing overeducation as a mistake, we could expect that the whole workplace was benefiting from those extra skills.

But, as with so many other ideas, there is very little hard evidence. Of course, if you look at somewhere special, like Silicon Valley, something on these lines is certainly happening. The ideas generated by a critical mass of very clever and skilled people are greater than if you scattered that group evenly across the U.S. But the idea that a higher volume of education in a whole society creates spillover effects and, as a general rule, raises everyone's productivity, finds no clear empirical support. Nor is there anything to suggest that, in this respect, the new economy is vastly different from the old.

CONCLUSION

Throughout the developed world, the mass of politicians take it for a fact that education and economic growth are directly linked. They translate this into an enthusiasm for more education spending; yet the balance of evidence is clearly against them. One argument after another falls apart on closer examination. There is no indication that this, or any other developed country, is spending below some critical level, or that pumping more money into education will guarantee even half a percent a year's extra growth.

At the same time, we do have some indication of what is important. We know that employers use qualifications partly as a simple screening device, and that, in a modern economy, people are well aware of this. Industrial economies create their own demand for education. At the same time, schooling and qualifications do signal certain substantive skills – and people's earnings are related not just to their paper qualifications but also to their relative academic ability and to (some) things they have studied and learned. We know that basic literacy and numeracy matter a great deal and that the labor market rewards mathematical skills. We also know that technical progress depends on the scientific research, but that there is no evidence that education spills over to raise economy-wide productivity.

Of course the opposite applies as well. We don't recommend cutting educational expenditure in some sweeping fashion. From a purely economic point of view, we don't have any idea of how much less education we could get away with. But all this suggests that a government serious about economic growth needs to be discriminating in its education spending. It needs to eschew sheer quantity, and think about where there is a clearly demonstrated demand, about where and for what it should be paying, and about the quality of what is provided. It is all too easy for developed as well as developing countries to sacrifice quality to quantity – a process more likely to reduce growth than stimulate it.

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BY DAVID CARD

Education Matters

Alison Wolf believes that education is oversold. Although everyone from parents to politicians seems to agree that we should encourage more children to enter college, in fact society (especially British society) doesn't need more highly educated workers. Instead, Wolf argues that we need more people at the lower education levels with improved reading and math skills. In other words, we need a rise in the "quality" rather than the "quantity" of education.

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I would argue that we probably need both. I would also argue that Wolf conveniently overlooks a lot of compelling evidence on the value of education in her attempt to derail fresh initiatives to encourage more schooling.

Wolf's attack on the myths about education and growth has three main strands. First, while acknowledging that people with more education earn more (and have lower unemployment), she argues that some of this gap reflects innate differences between the people who end up with more schooling and those who end up with less. Thus, policymakers overestimate the value of additional schooling by extrapolating from the earnings gap between more- and less-educated people.

Second, she argues that even if more education raises individual earnings, it has a much smaller effect on the total income of society because education is really a rat race. Employers use education to slot workers into better paying jobs. But when one worker gets ahead another falls behind, so the private return to schooling is much greater than the social return. If private and social returns differ, we have to move beyond narrow comparisons of individuals with different levels of schooling and focus instead on what happens when education is raised en masse.

This has been a major thrust of the "New Growth Theory" over the past decade, and in the third strand of her argument Wolf argues that the evidence comes up short. Instead of more education raising growth, she concludes that growth leads people to spend more on

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relatively unproductive schooling. In fact, she argues that Britain is overeducated. Since the average Brit has several years less schooling than the average American, readers on this side of the Atlantic might wonder if they should be asking for some serious budget cuts in our public education system.

DOES EDUCATION RAISE INDIVIDUAL EARNINGS?

The question of whether more education raises a person's earnings has received a lot of attention in the recent economics literature. Contrary to Wolf's argument, the consensus is that the earnings gap between people with more or less education is mostly a reflection of education per se, and not of differences in innate abilities. The basis of this consensus is a series of studies of what happens to people whose education was raised by changes in the schooling system. And coincidentally, one of the best examples comes from the U.K.

Until 1972, British children were only required to stay in school until age 15. Reflecting a long heritage of low educational attainment, the fraction leaving school at 15 was still over 30 percent in 1970. When a new law was passed raising the school leaving age to 16, about one quarter of the entire youth population was forced to stay in school an extra year. This is an ideal "natural experiment" for evaluating the benefits of extra schooling, since one can compare earnings, unemployment, health and other outcomes for people born in 1955 and 1956 to those born just a little later who were affected by the law. Comparisons can also be made to Ireland and Northern Ireland, where there was no change in minimum school leaving laws. The results show very clearly that the extra year of schooling paid off, raising earnings by well over 10 percent per year in later adulthood. The cohort that was forced to stay in school a little longer also reports better average health and greater life satisfaction.

Analyses of similar episodes around the world show a similar phenomenon. MIT economist Ester Duflo examined the effect of a school building program in Indonesia and found that the extra schooling led to extra earnings later in life, with a rate of return quite similar to the those obtained from naive comparisons across people with different levels of education. Unfortunately, Wolf has chosen to ignore this carefully developed body of evidence.

IS THE SOCIAL RETURN TO EDUCATION LESS THAN THE PRIVATE RETURN?

A key tenet of conventional economic reasoning is that relative wages reflect relative productivity. Employers will only pay 40 percent higher wages for a college graduate than a high school graduate if on average the college graduate is 40 percent more productive. From this it seems like a short leap to the prediction that an added college graduate adds 40 percent more to national income than an added high school graduate. But as economic theorists in the 1970s showed, that is not necessarily true when education functions as a "signal" of productive ability, rather than enhancing productivity directly. In the rat-race model of education emphasized by Wolf, people with higher innate abilities prove themselves by enduring extra years of schooling. Employers will only hire you as a manager if you have a degree (so college has a true causal effect on individual earnings), but

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the degree itself is worthless. Thus, if we could find another way to sort out the high- and low-ability workers, we could dispense with it entirely. Moreover, if society encourages more schooling by making it cheaper or easier to get a degree, employers will simply notch up the standard; everyone ends up at the jobs they would have held anyway, and national income is no higher.

This line of reasoning has proved enormously attractive both to liberals (in the left-center American sense), who see the education system as the enforcer of an unfair class system, and to conservatives, who bemoan the erosion of standards in our schools. Stanford University economist Michael Spence, who originated the idea, recently shared the Nobel Prize for it. It has also proved remarkably elusive to empirical scrutiny. How do you test a theory that says that even though education is worthless, it pays off for any single person? The only way is to look for larger scale experiments where sizeable groups of people changed their educational choices, and see what happened to the group as a whole. The rat-race model predicts no change. The alternative view – that schooling raises productivity – predicts that the group as a whole will gain.

The British experience with the rise in the minimum school leaving age is again an excellent example. After the law was passed, people who would have left school at 15 had one more year of school. But why would any-

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one be fooled? Those who left at age 16 are the same people who previously left at 15, so employers should discount their extra schooling entirely. The fact that the cohort affected by the law had higher earnings throughout their adult lives than the cohort just before is direct evidence against the rat-race model, and in favor of the idea that the extra year of schooling had a real effect on productivity.

Another example of this "large scale experiment" idea is the G.I. Bill. Economists John Bound of the University of Michigan and Sara Turner of the University of Virginia found the education subsidy for ex-soldiers raised both education and earnings for the entire cohort of men born in the early 1920s.

There are other ways to evaluate the rat-race idea. One is to look at how education pays off in a market where employers don't know your rank in the education distribution. For example, consider British immigrants in the U.S. Although they are better educated than the average Brit, they are not much ahead of the average American worker. American employers are arguably ignorant of how to rank a British worker's education credentials – so why should these credentials have any signaling value in the U.S. labor market? But among British immigrants in the U.S. in the late 1990s, each additional year of schooling is associated with 10 percent higher wages – about the same as back home, or even a little higher.

My reading of the evidence is that education is much more than a rat race, and that signaling effects – if they exist at all – account for only a small fraction of the private return to schooling. On the other hand, I think it is possible that the social return to education actually exceeds the private return. For example, economists Lance Lochner of the University of Rochester and Enrico Moretti of UCLA find that raising the compulsory school attendance age in the U.S. leads to a rise in education, and that this in turn leads to a reduction in crime – a positive "externality" of education.

EDUCATION AND GROWTH – THE MACRO EVIDENCE

People who are interested in the connection between changes in economywide education and growth should read Alan Krueger and Mikael Lindahls' thoughtful piece in the *Journal of Economic Literature* (Dec. 2001). One of their key points is that the available educational attainment data for many countries are weak. This weakness is confounded when analysts attempt to estimate the effect of changes in education – as they do in the macro growth literature that tries to estimate the contribution of rising educational attainment to national income. Indeed, Krueger and Lindahl find that at least half of the variability of measured changes in schooling across countries is pure noise.

They reanalyze the correlations between education and growth, taking account of the measurement problems. Their conclusion: on average, economic growth is positively correlated with increases in schooling, with an effect that is not too different from the 5-10 percent rate of return predicted by the individual-level earnings differences. They caution, however, that the cross-country evidence is relatively fragile and fraught with problems of noncomparability, measurement errors and most fundamentally, a lack of a credible "research design." At the macro level there are few analogues to the rise in the British school leaving age, and almost none that can be as analyzed with a clear counterfactual notion of what would have happened in the absence of the change under study.

The posing of a well-specified counterfactual is the hallmark of good social science

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research. By this standard, Wolf's selective discussions of Egypt, Hong Kong, Korea and Switzerland fall short of the mark. Perhaps the only safe conclusion is that one can find examples of virtually any pattern of macro trends in growth and educational outcomes in the world. This is more or less the same message that emerges from Krueger and Lindahl's statistical modeling. The international evidence on economy-wide correlations between education and growth is indecisive.

SCOTT S. WARREN/AURORA

WHAT ABOUT TESTED SKILLS?

As an alternative to raising levels of education, Wolf argues that society should focus on raising math and literacy skills. It is well known that people with higher test scores have higher earnings, even holding constant their education. Does this mean that there is a shortage of math and literacy skills, or that the social return to a 10-point rise in math scores is above the social return to another year of school? The evidence is thin.

First, the apparent returns to test scores are potentially affected by the same problems as education itself. Do people with high math scores have other attributes that raise their earnings and contribute to the apparent "return" to math scores? I suspect they do.

Is there a "rat race" in test scores? In the U.S., there certainly is. Test scores are used to allocate slots at selective colleges and universities, and there is a minor industry devoted to training students to achieve higher test scores without necessarily learning anything useful outside of the test itself. Moreover, education reforms at the state and federal level have mandated ever more standardized testing with the goal of using scores to monitor and reward teachers and school administrators. With this shift in incentives, we have already seen improved test scores in many states. Whether this will have an economy-wide payoff is unknown. I am confident the implicit SAT cutoffs at the Ivy League colleges will rise in the coming decades.

In thinking about changing the direction of education policy toward specific skills, it is important to understand that all we can measure are "markers" of those skills – i.e., math and English test scores. We can devise policies to raise these markers. But will those policies have any effect on productive skills, or individual or national income? There are almost no studies that attempt to show a causal link from educational policy reforms to test scores to adult outcomes such as earnings.

A related problem in assessing the case for emphasizing skills is that we have little notion of what it will cost to raise math and literacy skills, or even how to do it. Test scores like the SAT are amazingly highly correlated with things we can't change, like parental education and ethnicity. Evidence from a randomized experiment in Tennessee analyzed by Princeton University's Alan Krueger suggests that lowering class size raises test scores, especially for minority and lower-income children. But critics of class-size reduction, notably Eric Hanuschek of the University of Rochester, typically argue that it is too costly. So even though I wish my students had stronger math and literacy skills, I am not optimistic that we will be able to devise broadly useable policies to raise these skills, or that the social return to such policies will match the return to other policies that raise overall education levels. M

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BY MICHAEL MILKEN

Most people approach corporate finance the way scientists deal with problems in the physical world: plug in the right formula and you'll come up with the solution. But as any scientist will tell you, at the very highest levels even the most technical pursuit becomes an art. In the same way that artists select from an infinite palette of colors, financiers choose from a broad palette of financial technologies and securities to build the correct capital structure for a business. As conditions change, they modify the structure to keep the business strong.

There is no optimum capital structure – X percent equity and Y percent debt – that can apply to different organizations, or to the same corporation at different points of time. Just as you can't make real money by putting a dollar bill on a copying machine, you can't successfully copy the financing technique that once worked for a particular company and transfer it to another era or another company. That's why I have always said that finance is a continuum with infinite variations and hybrids. It takes deep understanding of a company, its environment and the financing tools available to build sustainable growth that will reward shareholders and create jobs.

Within a few years of starting on Wall Street in the late 1960s, my department included more than a dozen divisions – each with special expertise in different types of assets. Collectively, we employed scores of financial instruments to help clients grow. One way we measured success was our ability to free management from unnecessary concern about short-term financing so they could concentrate on what they did best – run their businesses for long-term success. The managers of MCI, for example, had to devote a major portion of their time to raising capital for more than a decade. Then in 1983, MCI was able to issue a hybrid security – $1 billion in 10-year bond warrant units with a coupon substantially below what U.S. Treasury bonds were paying. Because the security created the optimum capital structure at the time, it turned out to be a good security both for investors and for the company. Over the next 10 years, MCI management spent little time raising capital. It could focus on building a revolutionary fiber-optic network that changed the face of communications in America. (Although, two decades later, MCI faced major problems after being acquired and controlled by a different management team, it was a remarkably agile and successful competitor in the 1980s.)

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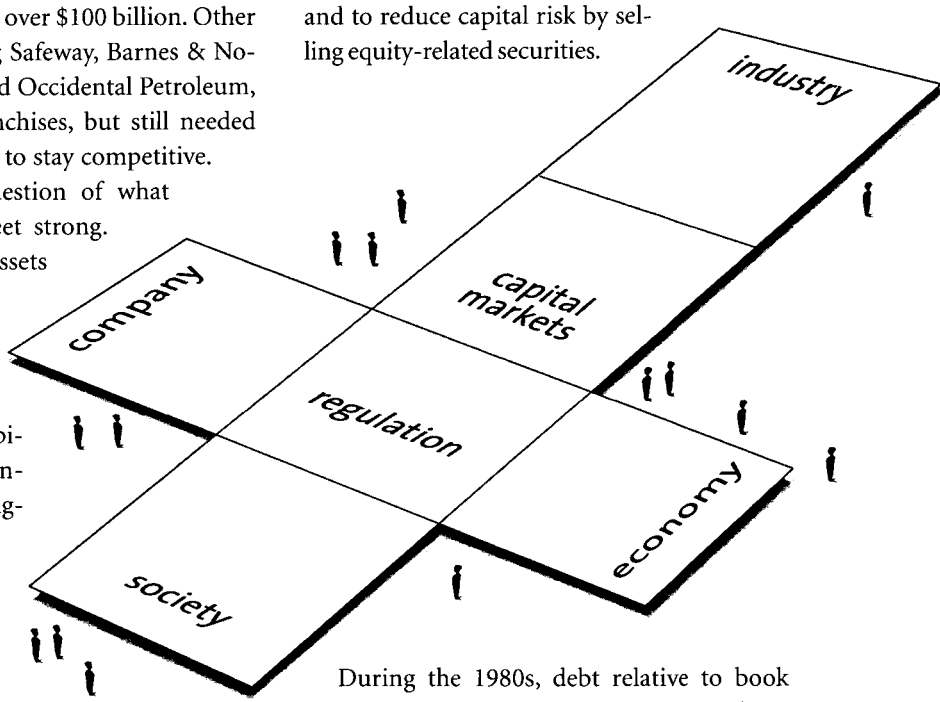
Building the right capital structure can be as important as managing other parts of a business. This was true for many of the growing companies that I had the opportunity to work with over the past 35 years. Companies like McCaw Cellular, MCI, Turner/CNN and TCI went through plenty of ups and downs in their basic businesses. But because they made the right capital-structure decisions, they had the staying power to survive and were later sold for a total of well over $100 billion. Other companies, including Safeway, Barnes & Noble, MGM Mirage and Occidental Petroleum, built established franchises, but still needed strong balance sheets to stay competitive.

This begs the question of what makes a balance sheet strong. Traditional "hard" assets – land, buildings, machinery – can lose value even as less tangible factors – human capital, management information systems, digital distribution networks – strengthen a company's ability to succeed. That kind of disparity between book value and real prospects sometimes contributes to popular myths. Any number of newspapers will tell you that the decade of the 1980s was dominated by debt. In fact, the 1970s was the decade of debt because the value of equities declined, and the 1980s was the decade of equity. Industrial companies ended the 1980s *less* leveraged than they entered it.

In the mid-1970s, as interest rates stabilized and stock market values declined relative to replacement values, many corporations used debt-oriented securities to extend maturities and finance growth. Because of the higher real replacement values, they often acquired existing assets rather than build from scratch. Thus, during the '70s, debt made up more than half the capital structure of the typical industrial corporation, reversing the trend of the 1960s when equity exceeded debt. By the late 1980s, with equity values for most companies above replacement costs, it made sense to make new investments and to reduce capital risk by selling equity-related securities.



During the 1980s, debt relative to book value for many companies was still fairly high. But that wasn't the correct ratio for determining how to finance future growth. The better measure was market-adjusted-debt ratios, a concept developed during my studies in the 1960s and advocated in a series of research papers in the early 1970s. Looking at finance this way, it becomes apparent that leverage can decline even as debt increases. For example, Exxon's equity market value in 1979 was $24 billion and its long-term debt was about $4 billion. During the 1980s, Exxon repurchased more of its common stock than

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any other public company – some $16 billion worth – and increased its long-term debt to more than $8 billion. Despite this large debt increase, the rise in equity market value to $63 billion was 10 times the added debt.

THE CORPORATE FINANCING CUBE

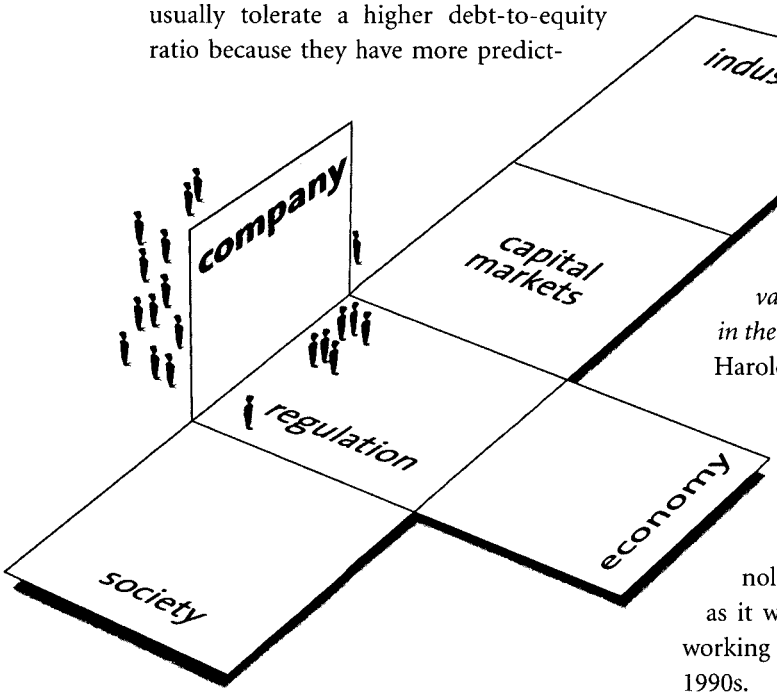
As important as financial ratios are to effective capital-structure decisions, they are only the starting point. There is a broader environment that will affect how the decisions play out over time. One way to grasp this environment is to visualize the six facets of a cube labeled as Company, Industry, Capital Markets, Economy, Regulation and Society.

1. The Company

Is the company an established national supermarket chain, a high-tech start-up, or something in between on the continuum of risk? Although there is growing competition in the supermarket industry, grocery companies can usually tolerate a higher debt-to-equity ratio because they have more predictable revenue (people always have to eat) and a stable business model. A technology company, on the other hand, should rarely sell debt because of inherent business volatility and competitive risk.

In such industries, it's difficult to predict revenue or to say with confidence that cash flow will be sufficient to service the debt. Yet technology companies have often made the mistake of issuing convertible bonds, weakening their balance sheets to the point they couldn't survive a cyclical business slowdown. If these companies have realistic business plans and qualified management, they should be able to meet their capital needs by selling equity to private investors, venture capitalists and the public.

Qualified management, of course, is a key to determining capital structure. It's not enough to have smart people at the top; you need to understand exactly what their talents are. If, for example, the CEO is skilled in finance, more leverage may be appropriate than for a company headed by a former sales executive. Assuming equivalent financial skills, however, the simple rule of thumb is that *risk in capital structure should vary inversely with volatility and risk in the basic business.* To paraphrase the late Harold Geneen of ITT, you can make a lot of mistakes in business, but you can't run out of cash. For some companies, even a dollar of debt is too much. This was as true for some airline, aerospace and technology companies of the late 1960s, as it was of the telecommunications, networking and Internet companies of the late 1990s.



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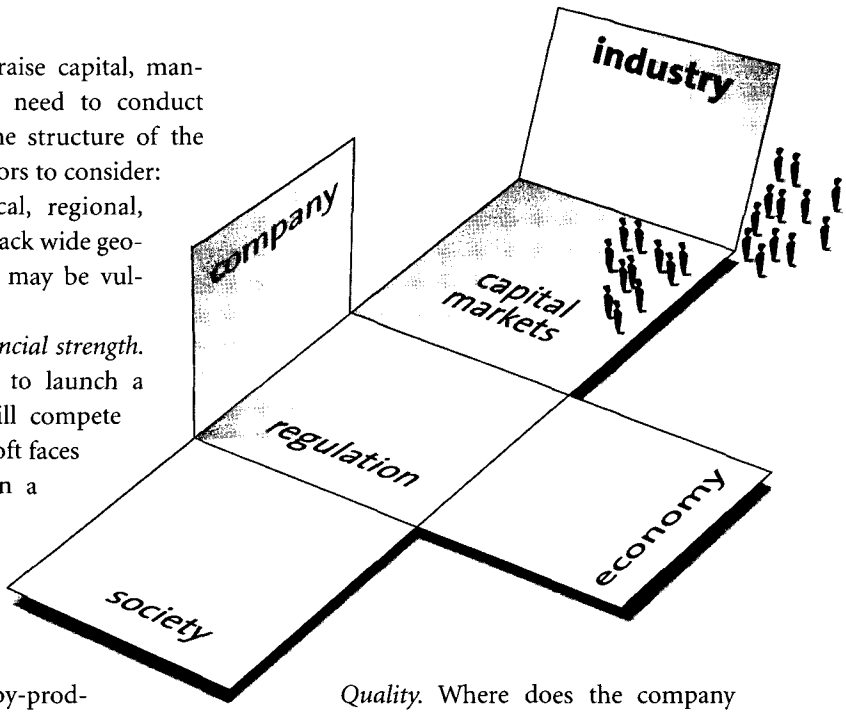
2. The Industry

Before deciding how to raise capital, managers and their advisors need to conduct exhaustive research on the structure of the industry. Some of the factors to consider:

Competition. Is it local, regional, national or global? If you lack wide geographic distribution, you may be vulnerable.

Concentration and financial strength. A small company about to launch a software product that will compete head to head with Microsoft faces a different challenge than a manufacturer in an industry with less concentration and no companies with strong balance sheets.



Cyclicality. In the baby-products industry, cycles take decades to play out; in semiconductors, things can change in a few months.

Competitive R&D levels. What percentage of revenue do companies in the industry spend on research and development? What is your risk of being severely hurt if that spending produces a new technology?

Barriers to entry. How easily and quickly can new entrants take market share?

Volatility. In the 1960s (and again in the 1990s), many technology companies were misfinanced, and ultimately failed because they didn't adequately consider the ups and downs of the industry.

Capacity. New companies entering the telecommunications industry in the late 1990s built far more capacity than was needed, driving down prices and leaving almost every player with insufficient cash flow to service debt. These companies would have had more staying power if they had put more equity into their capital structures.

Quality. Where does the company rank in the quality spectrum of the industry? The effect of a change in customer demand will play out differently across the industry. While a recession might mean a 50 percent drop in revenue for low-end companies, industry leaders often suffer milder effects.

If your competitors are financially strong and your customers count on you to keep them operating, you might need very substantial liquidity. In the late 1970s, MCI was a tiny company competing against an industry colossus, AT&T, which had AAA credit, a strong balance sheet and a 98 percent market share. Facing that kind of competitor, MCI needed to show staying power. By the early 1980s, the company planned to build an advanced network that would require large amounts of capital. Following what was then the largest debt financing in history, company management put an extra $500 million in cash on their balance sheet so that customers, suppliers and investors would know they were

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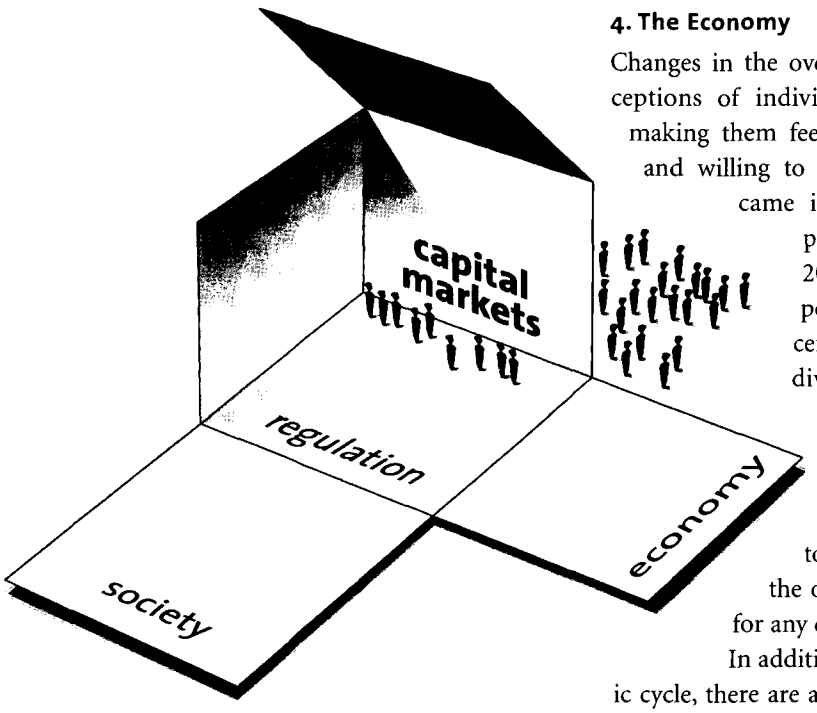

financially strong. Over the ensuing years, MCI's growth allowed it to create more than 50,000 jobs for American workers.

3. Capital Markets

A primary management goal should be maximum operational flexibility. This requires close attention both to the type of security used and the timing of its issue. Generally, companies should build capital structure from the bottom up, selling equity and junior subordinated debt when markets are strong. Just as you'd hold back your highest cards until you need them in a card game, you'll want to reserve the most senior securities at the top of your capital structure for a rainy day. The time to raise capital is when the market is most receptive, not when you most need the funds. Remember, you're not just raising capital; you're enhancing the company's staying power and increasing its flexibility.

4. The Economy

Changes in the overall economy affect perceptions of individuals and corporations, making them feel more or less confident and willing to spend. A "wealth effect" came into play in the 17-year period between 1983 and 2000 when stocks compounded at almost 15 percent a year, not counting dividends. That contrasts sharply with the 1 percent annual growth before dividends in the 17 years from 1965 to 1982. These cycles affect the optimum capital structure for any company.

In addition to the overall economic cycle, there are always sub-economies that follow their own rhythms. Every month, some industries are on the way up while others decline. Every day, no matter what the broad stock market indicators say, some stocks hit new highs and others new lows. Sometimes the disparity is driven by regional variations, such as the slump in the "oil patch" states in the early 1980s; sometimes the driver is demography, which has created growing demand in such industries as pharmaceutical products and financial services as baby boomers age. And sometimes a specific event will send an industry up or down – the end of the cold war drove down defense stocks, but they moved up following the 9/11 attacks.

5. Regulation

No company and no industry operates independently from regulation. In 1993, a new government health care plan would have led

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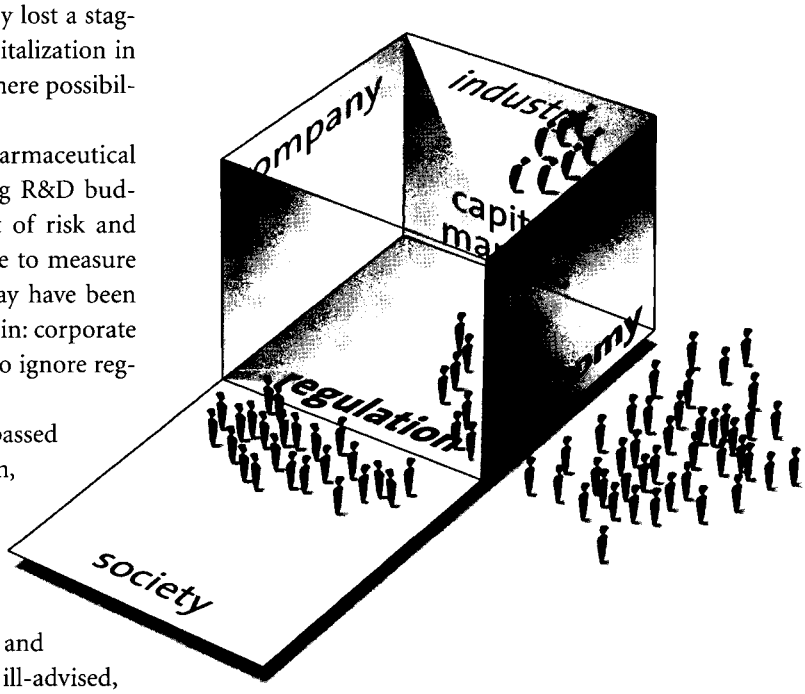
to sweeping changes in the pharmaceutical industry, including what some feared would be regulation of rates of return on investments. This would have had a major impact on an industry in which it can take 14 years to bring a new drug to market. The 10 largest companies in the industry lost a staggering $70 billion in market capitalization in only 14 months because of the mere possibility of regulated rates of return.

Tragically, but logically, pharmaceutical companies responded by cutting R&D budgets in a necessary realignment of risk and return. While we'll never be able to measure what medical breakthroughs may have been lost or delayed, one thing is certain: corporate managements can never afford to ignore regulatory developments.

In the late 1980s, Congress passed the Financial Institutions Reform, Recovery and Enforcement Act (FIRREA), which typified a brief period of over-regulation that targeted insurance companies, bondholders, banks and other lenders. Well-meaning but ill-advised, FIRREA banned investments by savings and loan institutions in non-investment-grade companies and forced the S&Ls to sell existing loans that had been made to these enterprises – the very companies that create all the new jobs in America. (Over the last 30 years, more than 100 percent of jobs created in the U.S. have come from small- and medium-sized companies that don't qualify for "investment-grade" credit ratings. During the same period, the 800 or so investment-grade companies have actually *shed* a net four million workers while smaller companies created 62 million jobs.) At the time, there were only a handful of investment-grade companies headed or controlled by African Americans, Hispanics, women or unions.

Thus, as recently as the late 20th century, Congress effectively, albeit unwittingly, said it was illegal to provide capital to businesses headed by minorities and women, or to any company that would create jobs. It was OK to



make a mortgage loan that would build a building, but you couldn't finance the company that provided jobs for the people inside the building. That's why I called FIRREA and similar regulatory acts "neutron legislation" – like a neutron bomb, they left buildings standing but eliminated the people, or at least their jobs. Because only a handful of our 50 states have more than a few dozen investment-grade companies (some states have no such companies), Congress effectively redlined most regions of the country, reducing asset values and employment.

6. Society

This is in some ways the most important facet

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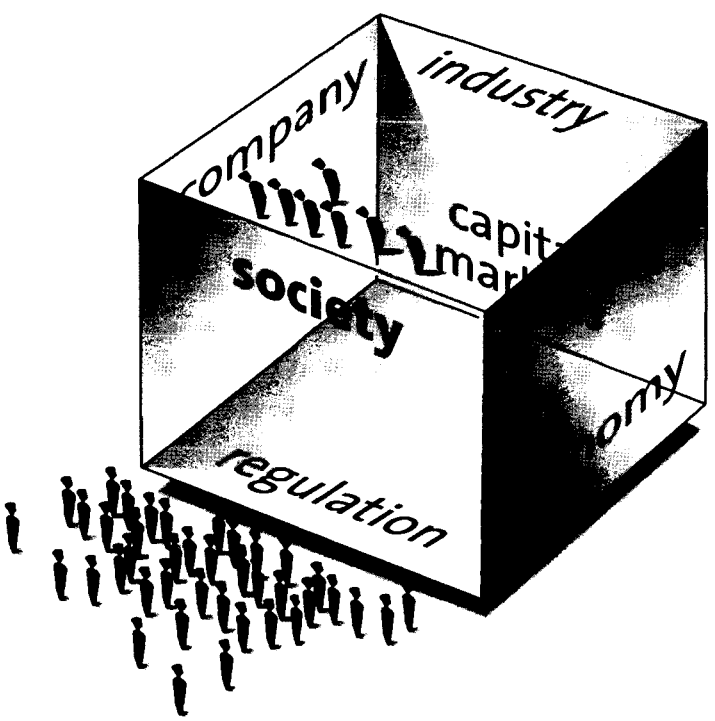
of the cube. Businesses always need to understand which way society is going on the key issues that affect their products. If you are perceived as part of the solution to current social concerns, then you're well positioned. But if you're part of the problem, you may want to exit the business. At the very least,



you'll need a more conservative financial structure.

As recently as 1986, the most valuable brand name in the world was Marlboro. Yet its value was about to begin a long and steady decline that can be attributed almost entirely to changes in our society and its view of smoking as a social rite. These changes did not come without plenty of warning. As early as 1939, the Surgeon General of the United States suggested that smoking could be bad for your health; a later Surgeon General's report in the 1960s concluded that there was a direct link between smoking and cancer. Congressional hearings in the 1990s raked tobacco-company executives over the political coals and encouraged massive lawsuits against the industry.

Just as smoking became an epidemic in the 20th century, today a new epidemic – obesity – presents a growing threat to the health of our nation. More than half of Americans are overweight or obese, which leads to some 300,000 unnecessary deaths each year and costs our economy more than $100 billion. In much the same way that tobacco marketers were eventually held responsible for promoting unhealthful products, the new epidemic will undoubtedly encourage litigation in search of judgments against those purveying unhealthy food. Whether or not this is justified is a matter for the courts. The key for investors and corporate managers is risk analysis.

Where is society heading in the 21st century? The two largest sectors of the U.S. economy – health care and education – are poised to expand and become an even larger share of gross domestic product. In 1950, there was not a single health care or pharmaceutical company among the 100 corporations with the largest market capitalizations. Today, 17 of the top 100 companies in the world, including five of the top 15, are pharmaceutical, biotechnology or medical products companies. Health care already accounts for about 15 percent of U.S. GDP and its slice of the national economic pie continues to grow.

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Education may well follow a similar path. No education company is currently listed among the top 100, but several are growing fast and could be there within a decade as private enterprise responds to the growing need for lifelong learning.

THE IMPORTANCE OF HUMAN CAPITAL

Finally, any analysis of capital structure should recognize that most balance sheets are dramatically misleading because (with the exception of professional sports franchises) they fail to include the value of human capital. Gary Becker, the Nobel Prize-winning economist, calculates that human capital – the knowledge, skills, experience and earning power of people – accounts for more than three quarters of the asset value on the national balance sheet. It may sound like a platitude to say that people are the most important asset, but in fact they are.

The market capitalization of many companies has changed by billions of dollars within hours of a change in CEOs. And with good reason. The right leader can make or break a company. No matter how strong the company seems, its future depends on the quality of its leadership. With every passing year, however, the people at every organizational level grow in importance. In the 1920s when automobiles became a huge industry, 60 percent of the cost of producing a car was in raw materials and energy. For today's computer chips, raw materials and energy account for less than 2 percent of the cost. Brainpower has become the "raw material" for building companies. This human capital, combined with the social capital of democracy, open markets and the rule of law, is the basis of a prosperous economy.

Ultimately, the importance of finance in society lies in its ability to unlock the potential in people. Back in the 1960s, many students at the University of California, Berkeley, wanted to change society. "Unlike other crusaders from Berkeley," I wrote a few years later, "I have chosen Wall Street as my battleground for improving society because it is here that government institutions and industries are financed."

My first talk to the Wall Street community suggested that the best investors are social scientists. Such investors see beyond financial statements and physical assets to the changing needs and tastes of people. They respond to the opportunities created by change. In doing so, they create value for society. The opening of our capital markets to people of broader backgrounds over the last 30 years has allowed far more individuals with a dream to test themselves in the marketplace. That has strengthened our economy to be sure. Equally as important, it has strengthened our democracy. M

Gary Becker, the Nobel Prize-winning economist, calculates that human capital – the knowledge, skills, experience and earning power of people – accounts for more than three quarters of the asset value on the national balance sheet.

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BY ROSS DEVOL

The factors that make a regional economy vibrant and prosperous have been fundamentally altered in recent decades. In the old economics of place, it was the accumulation of physical assets and infrastructure – access to water transport, railways and raw materials, along with cheap labor and low taxes – that largely drove economic success.

What we call the new economics of place is driven by the ability to attract and expand science and technology assets, and leverage them for economic development. Thus, a region's economic performance is largely determined by how effectively it uses its comparative advantages – everything from the presence of world-class universities to recreational opportunities to affordable housing – to create and expand knowledge assets and convert them into economic value.

How does this square with the tech stock bust and Wall Street's newly found aversion to industries that don't make products you can see and touch? The term "new economy" is no longer in vogue – few investors want to be reminded about the diminished value of their stock portfolios, or that they took reported corporate earnings from highfliers at face value. By the same token, the hordes of unemployed telecom engineers and MBAs who staked their careers on companies with names that had capital letters in the middle are presumably less finicky about finding employers who

ROSS DEVOL is director of regional and demographic studies at the Milken Institute.

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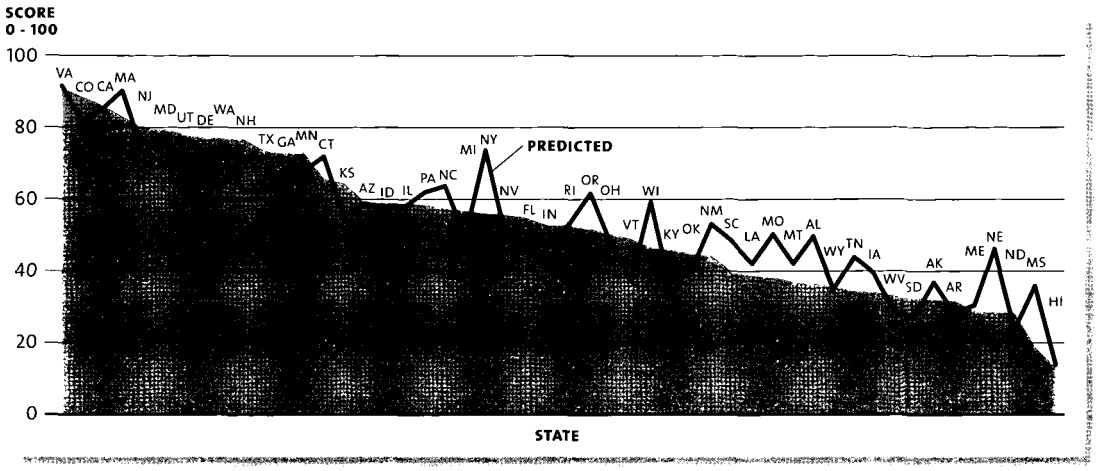
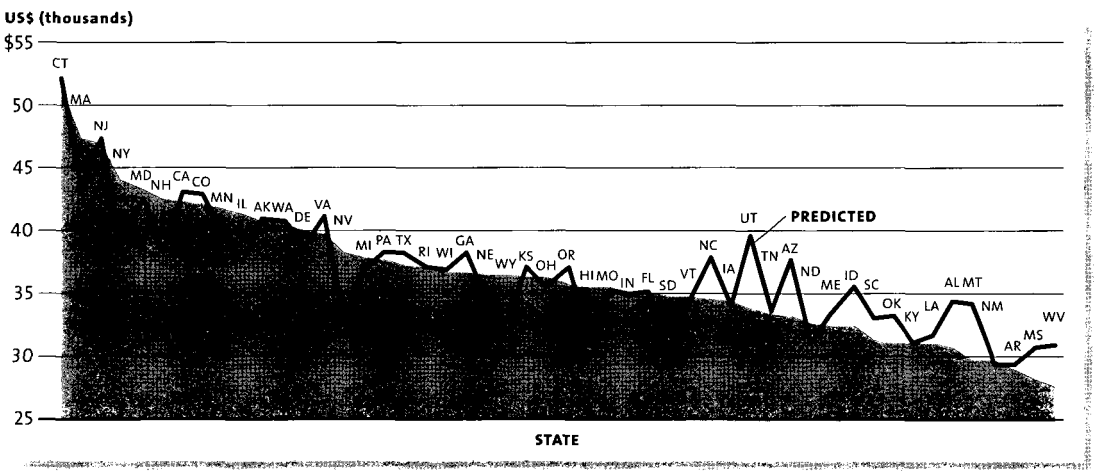
TECH OUTCOMES VS. OTHER COMPONENTS


SCORE
0 - 100
100
80
60
40
20
0
VA CO CA MA NJ MD UT DE WA NH TX GA MN CT KS AZ ID IL PA NC MI NY PREDICTED NV FL IN RI OR OH WI VT KY OK NM SC LA MO MT AL WY TN IA WV SD AK AR NE ME ND MS HI
STATE

PER CAPITA INCOME & TECH AND SCIENCE INDEX

INCOME RELATIVE TO WORKING AGE POPULATION, 2001


US$ (thousands)
$55
50
45
40
35
30
25
CT MA NJ NY MD NH CA CO MN IL AK WA DE VA NV MI PA TX RI WI GA NE WY KS OH OR HI MO IN FL SD VT NC IA UT PREDICTED TN AZ ND ME ID SC OK KY LA AL MT NM AR MS WV
STATE

serve pizza at midnight or let them bring their golden retrievers to work.

But the boom-and-bust mentality of high-tech sectors doesn't mean that technological change is any less important to the future of regional economies, and it hardly refutes the proposition that new technology is changing the rules in many sectors. Perhaps what we need to clear the air is a new term. I nominate "intangible economy" – industries in which patents, copyrights, customer relationships, brand value, unique institutional designs, future products and services, and structural capital (culture, systems and processes) trump tangible assets like machines and buildings.

To provide a benchmark for states seeking to place themselves in the context of the intangible economy and to monitor their progress, we created an index that inventories

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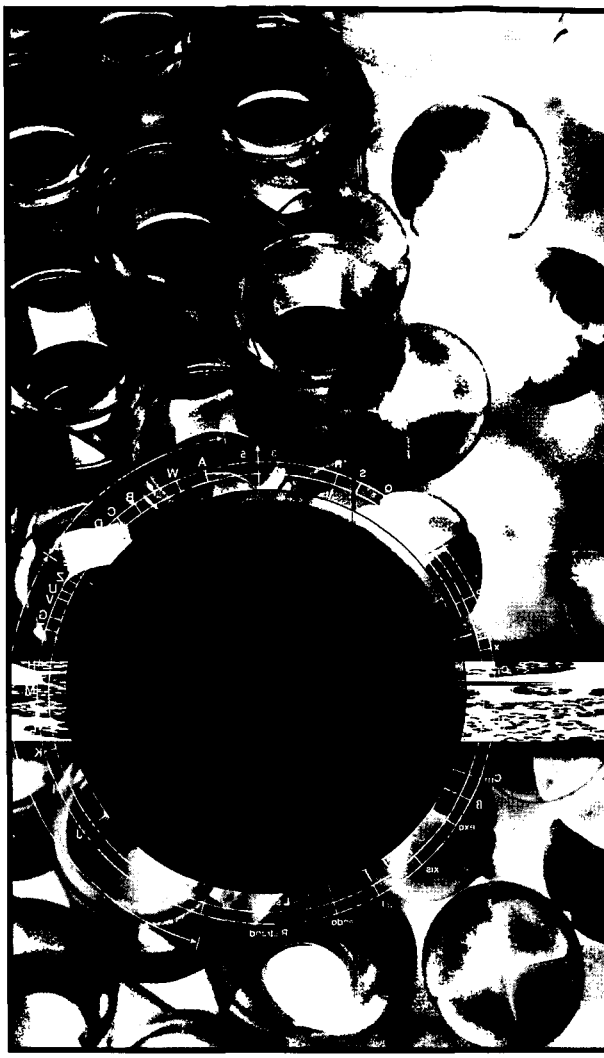
technology and science assets that can be leveraged to promote economic growth. This State Technology and Science Index is derived from five major subindices: R&D inputs, risk capital and entrepreneurial infrastructure, human capital investment, technology and science workforce, and technology concentration and dynamism.

Each of the components is measured on a relative basis to a relevant indicator (population, gross state product, number of establishments, etc.) The data were collected from a number of governmental agencies, foundations and private sources, and compiled by the Milken Institute. While economists know that every index must introduce some arbitrary assumptions, in particular, the way the individual components are weighted to form the whole – we believe the State Technology and Science Index offers insights not otherwise available.

The index, in a sense, describes the ecosystem of economic development and sustainability. It is important to innovate constantly and to start firms to augment the diversity of the economic ecosystem because many big firms eventually stagnate or even disappear. Greater economic diversity lessens the chances of the entire ecosystem collapsing because several important species (firms) became extinct. (To this point, see the article by Iansiti and Levien on page 11.)

R&D capabilities can be commercialized for future regional and state technology growth. But the fuel that fires this commercialization is entrepreneurial capacity and access to risk capital. Thus, human capital and the institutions that maximize their flexibility are the most important intangible assets of a regional or state economy.

The density of the technology and science work force indicates whether states have



sufficient high-end technical talent on the ground. Technology concentration and dynamism can be viewed as a measure of technology outcomes. Measuring technology growth points to the effectiveness of policymakers and other stakeholders in transforming regional assets into regional prosperity.

CALIFORNIA AND STATE RANKINGS

Much of the following analysis is based upon comparisons of California to other top states, as this was the original goal of the project. All states, however, can benefit from the information on where they placed and why.

California's third position in the index

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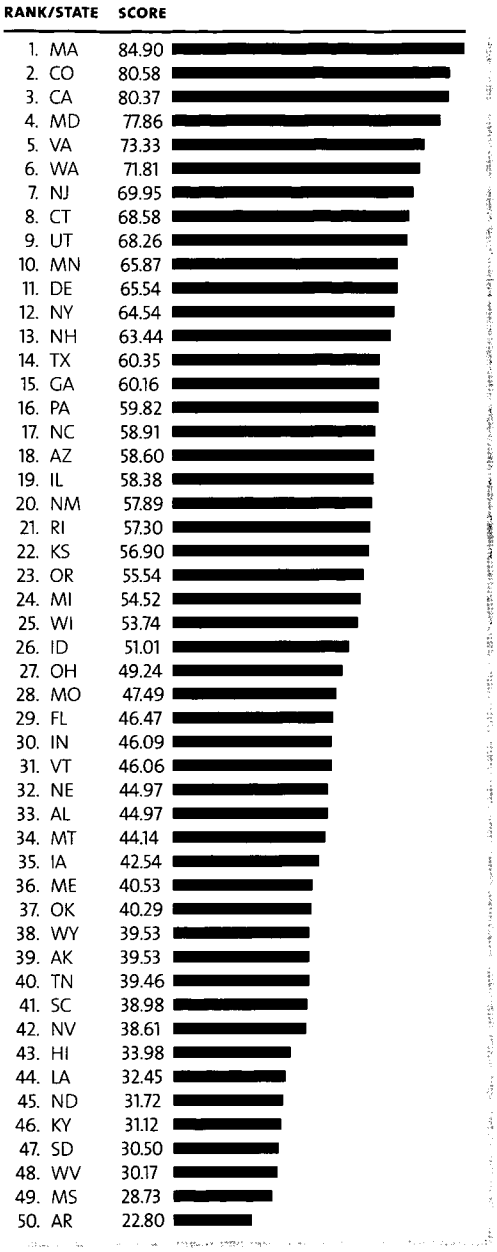
STATE TECHNOLOGY AND SCIENCE INDEX RANKING



rankings places it slightly behind Colorado, and far from first-place Massachusetts. But California's size and economic diversity make this third-place finish more impressive than it might first appear. It ranked from second to fourth on the five composite indicators – indeed, one could argue that California's strength is its consistent placement among the upper tier of states.

Massachusetts was first in three components of the index, and its research and development assets compared to the economy's size vastly exceed that of any other state. However, in terms of absolute levels of R&D funding, California surpasses all states by a substantial margin. The Golden State's disconcerting (relative) weakness is in production of human capital. However, it has been able to offset this weakness by attracting the best-trained technical talent from across the country and around the world. Colorado has slipped past California in relative performance – but just barely.

As suggested by its fourth-place ranking on the Technology Concentration and Dynamism component of the overall index, Massachusetts has not been as successful as California in converting science and technology assets into economic value. Massachusetts's social capital is apparently not as rich as California's. But if Massachusetts improves its ability to capitalize on its core assets, it would be even more of a technology powerhouse.

Colorado's technology story is one of remarkable success over a short period. Its leaders deserve a great deal of credit for vision. As biotechnology takes center stage as a factor in economic growth, Maryland's depth of high-end science and technical talent (fourth overall) could prove to be highly exploitable. Virginia has been the leader in converting its assets into economic value (fifth overall), as witnessed by its first place in Technology Concentration and Dynamism.

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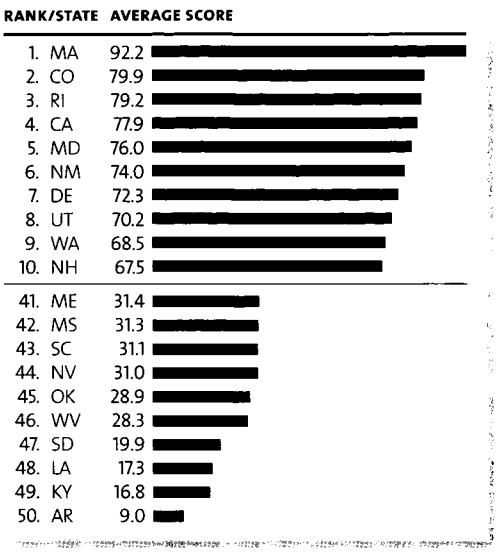
RESEARCH & DEVELOPMENT INPUTS
COMPOSITE INDEX, 2001



The state of Washington scores in the top 10 on each of the five components and is sixth overall. Microsoft and its software cluster members push the state into the upper ranks on intensity of software engineers. New Jersey is seventh overall, and was fifth on both Risk Capital and Entrepreneurial Infrastructure, and Technology Concentration and Dynamism. Connecticut is eighth overall, and scored high on both Risk Capital and Entrepreneurial Infrastructure, and Human Capital Investment. Utah came in ninth and ranked high in Technology Concentration and Dynamism. Minnesota, a leader in human capital investment, rounds out the top ten; it is the only Midwestern state in the upper tier.

Now for the bad news. Arkansas is in the unenviable position of ranking last on the overall index in spite of a place called Hope. Its best ranking was 45th on any of the five composites. Next to last was Mississippi, followed by West Virginia in 48th. South Dakota was 47th and had its highest rank (37th) on Human Capital Investment.

Kentucky came in 46th. But the good news was that it ranked 31st on Technology Concentration and Dynamism, suggesting that Gov. Paul Patton's technology and science focus is beginning to pay modest dividends. North Dakota was 45th and Louisiana 44th. But like Kentucky, the Cajun State ranked much higher on Technology Concentration and Dynamism (35th). Louisiana Gov. Mike Foster has focused his economic development efforts in this area.

Hawaii was 43rd and Nevada places 42nd overall, although Nevada has done much better in technology growth in recent years. Ranking 41st, South Carolina rounds out the bottom 10.

Regionally, the South is home to six of the bottom-10 states, with only Virginia in the upper 10 and just four others in the second tier of states out of a total of 16. All the states in the Northeast, with the exception of Maine and Vermont, score in the first or second decile. The Midwest has two states in the bottom 10, and just three in the second 10 out of a total of 12 states. The contiguous West has four states in the top 10, three in the second 10 and only one in the bottom 10 out of a total of 11 states.

STATISTICAL RELATIONSHIPS

The Technology Concentration and Dynamism component can be considered an outcomes measure. Hence we used regression analysis and other econometric techniques to assay how much of the Technology Concentration and Dynamism composite could be explained in a statistical sense by the other four components of the index.

Some 80 percent of the variation across states could be accounted for by a very strong statistical relationship. The top chart on page

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RISK CAPITAL & ENTREPRENEURIAL INFRASTRUCTURE, COMPOSITE INDEX, 2001

RANK/STATE	AVERAGE SCORE
1. MA	84.9
2. CA	82.2
3. NY	79.6
4. CO	77.8
5. NJ	75.6
6. CT	72.9
7. GA	72.7
8. WA	71.3
9. MD	69.1
10. VA	68.9
41. IA	30.9
42. VT	30.2
43. MS	29.6
44. AK	29.3
45. KY	27.6
46. WY	27.3
47. AR	18.4
48. WV	18.0
49. SD	15.3
50. ND	9.8

TECHNOLOGY CONCENTRATION & DYNAMISM, COMPOSITE INDEX, 2001

RANK/STATE	AVERAGE SCORE
1. VA	91.0
2. CO	88.6
3. CA	86.2
4. MA	83.0
5. NJ	80.2
6. MD	79.8
7. UT	78.2
8. DE	77.4
9. WA	77.4
10. NH	77.2
41. IA	34.4
42. WV	33.4
43. SD	33.0
44. AK	32.4
45. AR	32.0
46. ME	29.6
47. NE	28.8
48. ND	28.6
49. MS	19.2
50. HI	13.8

87 displays this relationship of the actual values versus those predicted from the equation. The relationship with all four independent variables were highly significant in a statistical sense, but the Risk Capital and Entrepreneurial Infrastructure composite was the most important single variable in explaining technology outcomes across states. Human capital appears to be critical. But without strong entrepreneurial skills and risk capital, it isn't fully leveraged for maximum technology performance. On the other hand, without high-end technical talent, entrepreneurial skills don't matter much.

Another way to test the relevance of our State Technology and Science Index is to look at its relationship to average incomes of the working age population. We found (see page 87) that the State Technology and Science Index explained over 75 percent of the variations in income – a powerful relationship, indeed, in that the probability of it arising

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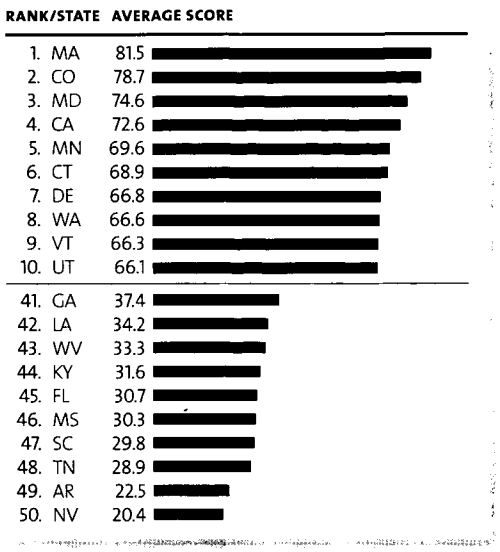
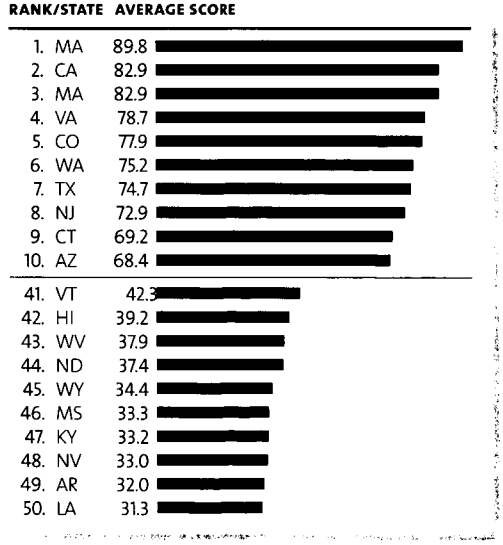
HUMAN CAPITAL INVESTMENT
COMPOSITE INDEX, 2001



TECHNOLOGY & SCIENCE WORKFORCE
COMPOSITE INDEX, 2001



from chance was less than one in a million.

In the future, we hope to examine these relationships over time in order to better establish the lags between cause and effect. We also want to dig deeper in order to establish how the rates of return to investment are related to where a state stands on the scale of development in science and technology infrastructure. It may be that relatively undeveloped states have lots of low-hanging fruit to harvest. Alternatively, there may be economies of scale in science and technology development that tend to widen the gap between the have and have-not states.

CALIFORNIA-CENTRIC CONCLUSIONS

For the moment, a number of conclusions ring true for California:

The state must continue to increase funding of science and technology in its university systems or risk losing one of its most important comparative advantages. The commitment to establishing three new Regional Science and Technology Innovation Centers is a key step.

California's slowing growth and the strong emergence of venture capital outside the state should serve as a warning against complacency. The recent retrenchment in the state's technology industries and the reduced availability of venture capital suggests the state must refocus its efforts.

The state does not produce enough scientists and engineers to meet industry demand. California makes up the difference by attracting the best-trained engineers from around the world. But this is both a source of strength and weakness for the state. More effort must be focused on training California's native population in science and technical fields, especially Latinos and African-Americans. Even with the harsh choices demanded of state budgets in times of recession, spending on higher education should remain a priority.

California's diversity in its technology clusters – which range from computer development to motion picture production ser-

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AVERAGE MATH SAT SCORES 2001

RANK/STATE	AVERAGE SAT SCORE
1. IA	603
2. ND	599
3. WI	596
4. IL	589
5. MN	589
6. SD	582
7. KS	580
8. MO	577
9. MI	572
10. UT	570
11. NE	568
12. LA	562
13. OK	561
14. AL	554
15. TN	553
16. MS	551
17. AR	550
18. KY	550
19. WY	545
20. CO	542
21. ID	542
22. NM	542
23. MT	539
24. WA	527
25. OR	526
26. AZ	525
27. CA	517
28. NH	516
29. HI	515
30. MA	515
31. NV	515
32. NJ	513
33. WV	512
34. AK	510
35. CT	510
36. MD	510
37. VT	506
38. NY	505
39. IN	501
40. VA	501
41. ME	500
42. DE	499
43. FL	499
44. NC	499
45. PA	499
46. RI	499
47. TX	499
48. GA	489
49. SC	488
50. OH	479

RECENT BACHELOR'S DEGREE IN SCI OR ENG

PERCENT OF CIVILIAN WORKFORCE, 1999

RANK/STATE	PERCENT OF CIVILIAN WORKFORCE
1. MA	2.96%
2. NC	2.43
3. CO	2.42
4. VT	2.30
5. WA	2.10
6. SD	2.05
7. KS	1.98
8. ME	1.97
9. NE	1.94
10. MN	1.92
11. NY	1.88
12. DE	1.78
13. CT	1.76
14. OR	1.65
15. MD	1.63
16. CA	1.56
17. OK	1.50
18. MI	1.46
19. VA	1.43
20. MT	1.42
21. WY	1.34
22. SC	1.32
23. NM	1.31
24. TX	1.31
25. GA	1.29
26. MO	1.29
27. NH	1.26
28. UT	1.25
29. AZ	1.24
30. NJ	1.23
31. IA	1.21
32. IL	1.20
33. IN	1.20
34. OH	1.17
35. ND	1.14
36. TN	1.09
37. MS	1.05
38. AL	1.00
39. RI	0.99
40. PA	0.97
41. FL	0.93
42. KY	0.77
43. WI	0.75
44. HI	0.71
45. LA	0.70
46. ID	0.69
47. AK	0.64
48. NV	0.55
49. AR	0.42
50. WV	0.42

vices – continues to be its strongest asset in the face of technology cycle peaks and troughs. To sustain this diversity the state must aim to improve its quality of life standards as well as minimize its cost of doing business. Keeping business costs competitive will also make California more successful at attracting entrepreneurs.

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AS GOES MASSACHUSETTS?

Investments in science and technology – from higher education to industry research and development – are critical in deciding the fates of regional economies, says a new report from the Milken Institute. And according to a state-by-state comparison released along with the report, Massachusetts, Colorado and California are in the best position to succeed. Indeed, institute economists found a strong causal link between regional investments in science and technology, on the one hand, and personal income and regional economic growth on the other.

State Technology and Science Index: Comparing and Contrasting California was underwritten by TechVentures Network (formerly the Bay Area Regional Technology Alliance). It is available for purchase or viewing on the Institute's web site at www.milkeninstitute.org along with the complete state-by-state rankings for all 50 states.

BIGGER IS BETTER

Mergers and acquisitions have been part of the American corporate landscape for 150 years. But are they good for the corporations and consumers – and for the economy?

In a word, yes. Research economist Susanne Trimbath found that roughly two-thirds of the mergers by 276 publicly held Fortune 500 companies over a 15-year period resulted in increased efficiency. The top 100 most-improved firms increased efficiency by 5 percent after merger, for an average annual savings of $250 million each. And while some layoffs did occur, the job losses were not large.

The research is available in a new book, *Mergers & Efficiency: Changes Across Time*, the third volume in the Milken Institute Series on Financial Innovation and Economic Growth. It is available through Kluwer Academic Publishers online at www.wkap.nl/prod/s/MILK.

WELCOME, JIM OSTERHOLT

James W. Osterholt, one of the nation's most respected development executives, has been appointed Vice President for Development at the Milken Institute. "Jim will play a crucial role in expanding the numbers of individuals and entities involved with the Institute, explained Michael L. Klowden, President of the Institute.

Osterholt was formerly the executive director of development at RAND, where he managed its philanthropic and development activities. Prior to joining RAND in 1996, he held a number of development positions at UCLA, including associate vice chancellor. Osterholt helped create the university's recent $1 billion campaign, and earlier designed a $300 million campaign that was the largest effort of its type for a public university.

CRAFTED WITH PRIDE IN CALIFORNIA

Manufacturing has been overshadowed by the more glamorous service sector industries. But according to a new study from the Institute, it remains a crucial part of the regional economy. Not only does manufac-

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turing employ 1.9 million people in California, it creates millions more jobs thanks to its high "ripple effect" on the economy.

However, according to *Manufacturing Matters: California's Performance and Prospects*, the state has lost 115,000 manufacturing jobs since May 2000. While some of these losses reflect the downturn in high-tech, much of the decline is the result of California's steep cost of doing business.

Among the report's findings:

Some 3.8 million jobs in other sectors are tied to manufacturing. When indirect effects are added, an additional two and one-half jobs are produced in other sectors for each manufacturing job created in California.

Average annual wages in California manufacturing range from $102,900 in the computers and machinery industries to $19,796 for apparel and textile product workers.

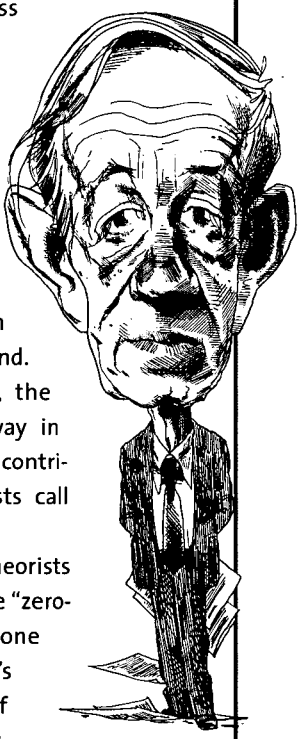
STATE OF THE GOLDEN STATE

Offering a "tough love" view, speakers at the 4th annual Milken Institute California State of the State Conference lauded the state's many strengths, but warned of problems dogging its future. California remains a global economic powerhouse. And there was guarded optimism that the state will dig its way out of the tech-driven downturn.

Among the clouds on the horizon: the high cost of doing business in California, shortages of skilled workers and the lack of affordable housing. For a summary, including audio recordings of the sessions, visit www.milkeninstitute.org/sos2002.

California Legislative Analyst Elizabeth Hill thinks positive.

The caricature on the spine, we suspect you've already guessed, is America's most celebrated Nobel Prize-winning economist – and perhaps the one whose work is least understood by non-economists. Indeed, some would argue that he's not really an economist at all, but a world-class mathematician.



Yes, that's right: It's John F. Nash, whose best-selling biography, *A Beautiful Mind* by Sylvia Nasar, was made into an Oscar-winning movie. Nash's personal struggle with schizophrenia is now legend. Not surprisingly, though, the movie made little headway in explaining Nash's singular contribution to what economists call the theory of games.

Prior to Nash, game theorists had only managed to solve "zero-sum" games, in which one player's gain was another's loss. But the world is full of games – think of markets with relatively few buyers and sellers – in which the outcome generates a net gain in welfare. Nash outlined the mathematics for "solving" – that is, finding equilibria – in such games, which had the property that no player could benefit by changing his strategy while the other players keep their strategies unchanged.

Esoteric? Yes. Important? Very; it led to an explosion of research in a field that seemed to be on its way to a backwater in the history of economics.

RIGHT: DAVID SMITH; LEFT: COURTESY OF THE MILKEN INSTITUTE

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RICH AND POOR

PERCENT OF INCOME GOING TO THE:	TOP DECILE OF INCOME EARNERS	BOTTOM DECILE OF INCOME EARNERS
Australia	25	2
Belgium	20	4
Bolivia	32	2
Brazil	48	1
Canada	24	3
Central African Rep	48	1
Chile	41	1
China	30	2
Czech Republic	22	4
Denmark	24	2
Egypt	25	4
El Salvador	38	1
France	25	3
Guatemala	47	1
India	34	4
Israel	27	3
Japan	22	5
South Korea	24	3
Mexico	37	2
Mozambique	32	3
New Zealand	30	1
Russia	39	2
South Africa	46	1
Sweden	20	4
U.K.	27	3
U.S.	31	2

SOURCE: CIA

WHERE THE RICH LIVE

SELECTED PLACES	BILLIONAIRES PER TEN MILLION POPULATION	PER CAPITA INCOME ($)
Arkansas	22	23,000
California	14	33,000
Canada	5	25,000
Dallas-Ft.Worth	25	35,000
Florida	6	28,000
France	3	24,000
Germany	4	23,000
Hong Kong	17	25,000
Illinois	7	33,000
Italy	2	22,000
Japan	2	25,000
Massachusetts	14	39,000
Mexico	1	9,000
Minnesota	10	33,000
Nevada	19	30,000
New York City	28	39,000
New York State	16	36,000
San Francisco	53	50,000
Saudi Arabia	4	10,000
Singapore	12	27,000
Spain	5	18,000
Switzerland	18	29,000
U.S.	8	36,000

SOURCE: *Forbes*, CIA, U.S. Census

VIEW FROM THE TOP

THE RICHEST CITIZEN'S WEALTH AS A MULTIPLE OF THE AVERAGE ANNUAL PER CAPITA INCOME

COUNTRY	RATIO	COUNTRY	RATIO
Australia	108,000	Malaysia	398,000
Belgium	40,000	Mexico	1,264,000
Brazil	431,000	Netherlands	176,000
Canada	601,000	Philippines	450,000
Chile	149,000	Portugal	108,000
China	278,000	Russia	480,000
France	611,000	Saudi Arabia	1,900,000
Germany	873,000	Singapore	117,000
Greece	198,000	South Africa	390,000
Hong Kong	394,000	Spain	500,000
India	3,438,000	Sweden	604,000
Indonesia	621,000	Switzerland	294,000
Ireland	98,000	Taiwan	264.000
Israel	175,000	Thailand	194,000
Italy	326,000	Turkey	490,000
Japan	345,000	UAE	79,000
Kuwait	377,000	U.K.	294,000
Lebanon	800,000	U.S.	1,460,000
		Venezuela	800,000

SOURCE: *Forbes*, CIA

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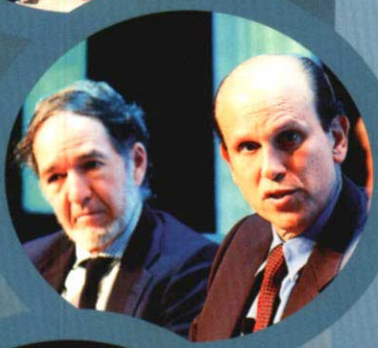
2003 Milken Institute Global Conference

March 31, April 1 & 2, 2003

Los Angeles ■ California



There are many reasons to attend the 2003 Global Conference. However, one stands out from all the others: 2004

Get ahead of the competition. Find out where tomorrow's opportunities lie.

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How to tell the dominators from the keystones.

SHELDON DANZIGER
Revisits welfare reform.
It worked during the boom, but what happens now?

JENNIFER BREMER AND JOHN KASARDA
On the New Second World.
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MARCUS NOLAND
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MICHAEL MILKEN
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ALISON WOLF
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What's good for one isn't necessarily good for all.

DAVID CARD
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